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# The relationship between investment intensity and profitability measures from the perspective of foreign investors

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Investment intensity is the level of investment in fixed assets that affects a company's long-term growth prospects. In order to make good investment decisions, investors pay more attention to achieving a high level of investment intensity. This study examines the impact of two non-GAAP measures of profitability—earnings before interest, tax, depreciation, and amortization and earnings before interest and tax—on investment intensity in Gulf Cooperation Council (GCC) member countries. The study also examines the preference for two non-GAAP measures of profitability from the perspective of foreign investors. The study conducts panel data regressions using 205 firm observations covering the period 2010–2019 to examine the relationship between earnings before interest, tax, depreciation and amortization, earnings before interest and tax, and investment intensity. The study used various statistical estimators to overcome the heterogeneity and endogeneity problems of panel data and employed many diagnostic tests to increase robustness. The study finds that earnings before interest, tax, depreciation and amortization are positively and significantly associated with investment intensity in all GCC countries, but earnings before interest and tax are negatively associated with investment intensity in these countries. The results indicate that foreign investors prefer to use earnings before interest, tax, depreciation, and amortization to make decisions about investment intensity. The main implication of the study is that capital market regulators and foreign investors should use earnings before interest, tax, depreciation, and amortization information as a guideline to improve investment intensity decisions and achieve a better allocation of resources in capital markets.

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## Introduction

Investment-intensive firms use a large portion of their resources to purchase fixed assets such as machines as opposed to investing in labor. The investment-intensive concept gained importance in early 2000 in the Gulf Cooperation Council (GCC) region when governments and businesses started thinking of reducing dependence on the oil and gas industry.

Over the last few years, the GCC-nonfinancial industry has been growing rapidly as a result of the vision of all six GCC countries that there should be a focus on increasing the economic growth of the nonfinancial industry. The performance of the nonfinancial sector is the third largest in terms of growth, and its contribution to GDP was 10.9% as of 2016 (Mishrif, 2018). GCC countries are diversifying their economies by giving the nonfinancial sector more attention due to its potential role in attracting new investments. The non-financial sector includes heavy manufacturing companies, such as steel, cement, etc., other than oil and gas. As the number of investment opportunities is unlimited for the nonfinancial sector along with the prospect of maximizing cash inflows, GCC countries achieve financial stability and a high probability of establishing diverse companies based on oil and gas output.

In the economic literature, investment intensity, and capital intensity are used interchangeably despite the differences between them (McGee, 2015). The main concern when working with both concepts is using the same proxies to measure them. Investment intensity is important for economic growth and sustainable development in the long term. The investment brings benefits to the firm in the future. Therefore, investors invest in investment-intensive firms, predicting attractive future prospects. These firms may also ignore current losses, keeping in mind future growth prospects.

Investment-intensive industries need a high number of financial resources to produce products or services and therefore play an important role in improving firm performance. A high level of investment intensity may increase the profitability of the firm, which will move the firm toward financial efficiency. Investment intensity represents an important variable that signals future profitability. Prior studies (e.g., Lee, 2010; Shaheen and Malik, 2012; Kalbuana et al., 2020; Maxim, 2021) find a positive relationship between investment intensity and firm performance. The findings of these studies show that firms invest in fixed assets because they play an effective role in sustaining a firm's success.

This study aims to examine the association between EBITDA, EBIT, and investment intensity in GCC countries. The study also aims to test the preference of foreign investors who use EBITDA or EBIT in determining investment intensity. This is an important issue because investors prefer to use a modified version of earnings such as non-GAAP rather than a GAAP version of earnings. Hence, the study answers the following questions: are EBITDA and/or EBIT good indicator(s) for investment intensity in GCC economies? Do foreign investors prefer to use EBITDA and/or EBIT in deciding the investment intensity in GCC economies? We build a dynamic model of investment and non-GAAP parameters where investors seek to maximize investment intensity. Our model shows the ability to use non-GAAP earnings in deciding investment intensity.

This study is conducted in GCC countries for multiple reasons. First, the previous literature focuses on EBIT and EBITDA as performance metrics but does not use these parameters in investment-intensive firms such as those in this study. The majority of these studies (e.g., Ester and Ballkoci, 2017; Chukwu and Egbuhuzor, 2017; Amoroso et al., 2017; Oeta et al., 2019) used other parameters, such as ROA and ROE, which are calculated and influenced by GAAP rules. To avoid the effect of GAAP parameters on investment, this study uses non-GAAP metrics: EBITDA and EBIT. Investors prefer using a modified version of earnings, such as non-GAAP, rather than the GAAP

version of earnings. Venter et al. (2014) found that non-GAAP earnings reported under a mandatory regime have higher value relevance than GAAP earnings. Entwistle et al. (2010) noted that investors highly weight non-GAAP performance metrics, which are more value-relevant than GAAP metrics. McClure and Zakolyukina (2021) found that by removing transitory items, such as depreciation and amortization, investment efficiency will improve non-GAAP performance. Black et al. (2018) noted that the number of firms reporting earnings on a non-GAAP basis, such as EBITDA, dramatically increased over the last decade. Second, GCC countries are more interested in economic diversification, as they take serious actions to invest away from oil and gas in order to develop policies in line with the expectations of foreign investors and investment in other related infrastructure. GCC countries give more weight to these investments as a source of revenue in the budget in their future visions. AL-Matari et al. (2021) pointed out that GCC countries were trying to have a good investment climate by accepting more foreign investment, which helps them to provide important platforms for new technology, maintain a healthy balance of payment (BOP) account for the gross domestic products (GDP) of the host country, create more job opportunities to reduce unemployment, and achieve economic integration. The association between GCC economies and foreign investments is a significant discussion, as these investments are new in these economies. Prior studies (e.g., Siriopoulos et al., 2021; Dkhili and Dhiab, 2018; Habibi and Karimi, 2017) have found that foreign investments are an important factor in GCC economic growth. GCC countries have a better economic environment and are capable of realizing the benefits of foreign investments because they have a higher degree of integration in global business. Third, capital intensity and investment intensity receive considerable interest in GCC countries. Al-Mejren (2019) asserted that GCC countries recognize the importance of investment intensity as an index that represents an appropriate indicator for judging the effectiveness of policies aiming to maintain the balancing of manpower in the labor market. Therefore, the results of this study add new empirical evidence from emerging markets that have not been addressed prior, i.e., whether foreign investors prefer to use the EBITDA/EBIT metric in making investment intensity decisions. Hence, the researchers believe that the findings of the study will add to the literature and will help managers, regulators, and investors make better decisions and achieve better allocation of resources in capital markets.

Universally, some studies have previously examined the association between profitability and investment intensity. The results are mixed, resulting in a positive or negative association between capital investments and profitability. Mithas et al. (2012), Yu et al. (2017), Sudiyatno et al. (2012), Pandya (2017), Pantea et al. (2014), and Nangih and Onuora (2020) found a positive and significant association between investment intensity and profitability, indicating that higher investment intensity results in higher profitability. Other studies (e.g., Singh et al., 2016; Aktas et al., 2015) found a negative association between investment intensity and profitability, indicating that higher investment intensity results in lower profitability. In discussing the association between profitability and investment intensity, most of these studies use GAAP profitability measures such as margin profit (Nangih and Onuora, 2020), return on assets (Pandya, 2017), and net profit (Mithas et al., 2012). This study uses non-GAAP metrics, which are more important from the perspective of investors (Jan et al., 2019). This study sheds light on the features of EBITDA and EBIT as measures of profitability and evaluates their validity as indicators from a foreign investor perspective.

In GCC countries, the association between investment intensity and profitability has not been addressed in the past despite its

importance. Thus, the current study aims to fill this gap. All six GCC countries started diversifying their economies by focusing on the performance of the nonfinancial industry as well as the finance and banking sector by increasing investments in these industries. There is a major transition in all six GCC countries that diversified their economies to focus on the nonfinancial sector by increasing investments in these industries, which is why GCC countries are selected as the research subject. Investment intensity is one of the most important topics in GCC countries for the following reasons. First, the capital markets of GCC countries are developing and rapidly growing. Second, in GCC countries, the attraction of many foreign investors from all over the world is due to the internationalization scheme that has started and the free-market policies that have been adopted by governments (Siriopoulos et al., 2021). GCC markets are classified as emerging economies, as they are becoming more engaged with global markets because of their growth.

In GCC countries, the performance of the nonfinancial sector plays an important role. First, the governments of GCC countries strongly believe that the nonfinancial sector is a good substitute for the oil and gas sector. Second, these governments of GCC countries want to ensure that the objectives are achieved to sustain investments in this sector. Third, the GCC countries encourage the private sector to invest in the nonfinancial sector to boost this sector through investment. Fourth, to make capital markets effective, the authority of capital markets in the GCC countries adopted a policy of attracting foreign investors by giving them an opportunity to invest in this sector.

This paper is structured into five sections as follows. Section "Introduction" presents the introduction. Section "Literature review and hypothesis development" details the literature review on investment intensity and EBITDA and EBIT. Section "Methods" presents the methodological and analytical analysis framework of the study. Section "Results" presents the empirical results of the study, followed by the discussion and conclusion with included implications and suggestions for further study.

### Literature review and hypothesis development

**Investment intensity.** Investment intensity is the level of investment in fixed assets and influences the growth prospects of the firm in the long run. It adds to capital assets today with the hope of increasing revenue in the future. It is a measure of how efficiently the firm is operating and generating revenues. Among firms in similar industries, with similar processes and similar profits, those with lower intensity are stronger, as they use fewer assets to generate more revenue. Investment-intensive firms incur huge fixed costs and depreciation on equipment and do not appear to be attractive. Adiloglu and Vuran (2017) pointed out that firms with high investment intensity need additional fixed assets due to high depreciation rates and high-interest payments on debt, often leaving them with negative earnings. Therefore, they have to achieve a high level of profit to cover these negative earnings. Investment-intensive firms are highly susceptible to the negative impacts of an economic slowdown as a decline in sales leads to difficulty in incurring fixed costs and depreciation on equipment, thus depleting profits. When the economy is in a downturn, investment-intensive firms experience losses (Rustam et al., 2019). Such firms seek ways to generate higher revenue. Investment-intensive firms are those where there is a robust investment in fixed assets. The nature of these firms is different from others where investment in fixed assets is low. The return-on-investment decreases as investment intensity increases. Therefore, firms need to use synergies strategically, and appropriate performance standards should be applied. Taking these complexities into consideration, the study has taken investment-

intensive enterprises as the research object. The study aims to examine the association between investment intensity and profitability in terms of non-GAAP measures which are EBITDA and EBIT. The uniqueness of the study is to test the preference of profitability metrics such as EBITDA and EBIT used by foreign investors in deciding the investment intensity.

Prior studies used different measures of performance and capital investments. Proxies such as return on assets, share return, productivity, Tobin's Q, earnings, net income, and operating income are used to measure performance (Grozdic et al., 2020). According to Murwaningsari and Rachmawati (2017), capital intensity is measured by the ratio of the total asset turnover of the capital turnover equal to the total assets to total sales; the higher the ratio is, the higher the capital intensity. Knesl (2019) and Kalbuana et al. (2020) pointed out that the capital intensity ratio indicates the level of efficiency of the total assets of the firm in generating a certain volume of sales. Therefore, if the total assets raise sales, the capital intensity will increase because more assets lead to more sales and finally generate a high level of profit. McGee (2015) used the change in capital share to measure investment intensity. Kotsina and Hazak (2012) used investment intangible fixed assets as a proxy to measure investment intensity. This proxy is calculated as the difference between tangible fixed assets at the end of the year and tangible fixed assets at the beginning of the year plus annual depreciation cost. Grozdic et al. (2020) used the growth of fixed assets as a proxy to measure investment intensity, and Fernández-Rodríguez et al. (2019) used the ratio of fixed assets to total assets to measure investment intensity. Kalbuana et al. (2020) used a fixed asset intensity ratio (total fixed assets/total assets) to measure investment intensity, as capital intensity represents how much of a company's fixed assets are out of its total assets.

Following prior studies, Nangih and Onuora (2020) used the change in tangible assets during the year plus the annual depreciation cost in their work. Adding annual depreciation cost enabled them to make a comparison between the performances of companies in the same industry, making it more understandable to the foreign investor since some differences exist among the depreciation methods across the world.

**Profitability and EBITDA and EBIT.** Profitability is the main determinant of the growth and expansion of the private sector. Chukwuma et al. (2022) argued that profitability is important for the survival and increase in the scale of business to achieve the final goal of growth. Profitability is measured by many proxies, such as return on assets (Ester and Ballkoci, 2017), return on equity (Chukwu and Egbuhuzor, 2017), operating income (Amoroso et al., 2017), and earnings (Oeta et al., 2019). To the best of the authors' knowledge, only one prior study used a different proxy to measure profitability, that is, earnings before tax, interest, depreciation, and amortization (EBITDA).

The present study uses two proxies to measure profitability, namely, EBITDA and EBIT and uses two alternative measures of profitability or earnings, such as non-GAAP measures that have been demonstrated in prior studies. Aubert (2010) found that pro forma numbers (non-GAAP) are much more informative than GAAP earnings. Investors prefer to use a modified version of earnings such as non-GAAP rather than the GAAP version of earnings. Venter et al. (2014) found that non-GAAP earnings reported under a mandatory regime have higher value relevance than GAAP earnings. The focus of EBITDA and EBIT is on the operating profits of the company. These performance measures gained popularity in the 1980s when levered buyouts were the trend. It was used as an alternative performance measure to conventional methods, such as net income, operating income, operating cash flow, and free cash flow (Finnerty and Emery,

2004). EBITDA is used as a metric to compare companies with different capital structures in the same industry; it is the third most commonly used metric for evaluating the earning capacity of companies in the US (Wahlen et al., 2015) and is considered to be a precise and nonbiased metric of performance. For example, EBITDA is a good indicator to measure profitability for some reasons. First, EBITDA is recommended as a proxy for cash flow and liquidity, which is a very important issue from a foreign investor perspective (Iotti and Bonazzi, 2012; Mukhambetov et al., 2020). Second, the studies in the global scenario used EBITDA as a preferable indicator because it removes the effects of tax, interest, depreciation, and amortization, which vary from one country to another. Adiloğlu and Vuran (2017) pointed out that EBITDA represents the real profit of the firm because it removes the effects of financing decisions, accounting decisions, tax environments, and depreciation expenses, which represent an exorbitant amount of money, especially for industrial firms. Third, Bouwens et al. (2019) asserted that when analyzing the performance of industrial firms, EBITDA is the best indicator because it excludes financing and investing effects, which allows investors to focus on operating profit as a measure of performance. Fourth, Christopher and Judson (2012) elucidated that firms with increasing working capital and longer operating cycles are likely to focus on EBITDA. Rozenbaum (2019) observed that traditionally high-leveraged and capital-intensive companies use EBITDA as their performance tool. It is used to reflect the ability of a company to service debt. According to Jan et al. (2019), firms with higher leverage and higher interest expenses use EBITDA more frequently as a performance measure than other measures. These reasons motivated the researchers to take EBITDA and EBIT as the performance measures in this study.

Using two profitability parameters means that the study tries to cover more than one angle. Providing more than one parameter will give more information and value to the investor when entering new markets. However, by using non-GAAP metrics (such as EBITDA), the effect of amortization and depreciation will be removed because amortization and depreciation as accounting issues are treated differently by each business and country. Here, investors will not find any difficulties in understanding the content of financial information.

**EBITDA and investment intensity.** Some prior studies (e.g., Chandrakumaramangalam and Govindasamy, 2010; Xin and Xu, 2012; Grazzi et al., 2016; Taipi and Ballkoci, 2017; Lian et al., 2017; Korent and Orsag, 2018; Singh and Bagga, 2019) found a positive association between investments and profitability. In contrast, other prior studies (e.g., Shima, 2010; Alipour et al., 2015; Zaigham et al., 2019; Bialowolski and Wezia, 2014; Reschiwat et al., 2020) found a negative association among different types of investments and profitability. These contrasting findings motivated us to study the relationship between a firm's investment intensity and EBITDA with special reference to companies in GCC countries. The data for the study are taken for a period of 10 years from 2010 to 2019 for nonfinancial listed firms in the GCC. From the discussion of prior literature, no such study was apparently conducted in the GCC countries. Therefore, the first hypothesis is

**H1: No association exists between EBITDA and investment intensity.**

**EBIT and investment intensity.** Another indicator that is commonly used as a proxy of profitability is earnings before interest and tax (EBIT). This measure removes the effect of

interest and taxes to state the operating profit, which is a good indicator to show managers and investors how a firm is performing (Sevella and Mayuri, 2018). Rodrigues et al. (2017) pointed out that EBIT focuses on the ability of the firm to generate sufficient earnings and cash flow from ongoing operations, excluding tax and interest, to be profitable, pay off debt, and fund ongoing operations.

Prior studies used EBIT as a performance indicator to predict the value of return on assets in relation to the growth in revenues and cost control (Myskova and Hajek, 2017). Others have used EBIT to determine the effect of capital structure and financial performance (Ahmed and Bhuyan, 2020).

The main result of the abovementioned studies finds a positive relationship between EBIT and the variables used in these studies. For example, Strouhal et al. (2018) noted that EBIT is more informative when it is used as a nominator in calculating return on assets, as it can have a relatively significant impact on business activities. EBIT also has a high comparison power in the case of firms with a higher level of debt in the capital structure because EBIT is more sensitive to different levels of debt within the capital structure. Concerning the relationship between leverage and EBIT, Ahmed and Bhuyan (2020) found that leverage impacts firm performance at a statistically significant level when this performance is measured by EBIT. Accordingly, the second hypothesis is

**H2: A positive association exists between EBIT and investment intensity.**

## Methods

**Sample selection.** The sample of this study consists of 205 nonfinancial firms from the stock markets of KSA, Oman, Bahrain, UAE, Kuwait, and Qatar from 2010 to 2019, and the data are from S&P Capital IQ. Like other related studies (e.g. Chukwuma et al., 2022; Jamil, 2022; Bibi and Sumaira, 2022). The study uses secondary data, which involves the collection of quantitative data. The total number of firms in this study is 683. This study excludes 326 banks and financial institutions due to the different rules and regulations implemented in both organizations. Accordingly, the final sample of the study includes 2050 firm-year observations. This study does not include data from 2008–2009 due to the impact of the financial crisis and its consequences. Table 1 shows the details of the sample.

**Variables.** This study has three groups of variables. The first is the independent variable, which includes two variables, namely, EBITDA, which is defined as earnings before tax, interest, depreciation, and amortization. The second independent variable is EBIT, defined as earnings before tax and interest. Prior studies (e.g., Entwistle et al., 2010; Iotti and Bonazzi, 2012; Rodrigues et al., 2017; Black et al., 2018; Brown, 2020; Arena et al., 2021) used EBITDA and EBIT as measures of non-GAAP metrics because firms are able to adjust the profit in the income statements into these metrics. Sherman and Young (2018) pointed out that many firms prefer to disclose “the common unofficial metric such as EBITDA” to enhance the comparability of financial information. Arena et al. (2021) asserted that the reporting of both EBITDA and EBIT improves the relevance of financial information by increasing the predictive ability of earnings. Following prior studies, this study uses EBITDA and EBIT to measure profitability, as they have more value relevance from the perspective of investors. The values of EBITDA and EBIT were calculated and stated in the IQ capital database. The second group includes the dependent variable, which is investment intensity (INV). INV is measured by the total assets at the end of the year

**Table 1 Sample distribution by country.**

	KSA	OMN	QAT	BAH	KWU	UAE	Total
Total listed firms (1)	171	107	43	42	173	147	683
Financial firms (2)	50	31	17	24	118	86	326
Nonfinancial firms 3 (1-2)	121	76	26	18	55	61	357
Firms with losses (4)	4	0	0	0	11	0	15
Firms with missing data (5)	31	11	12	10	37	42	143
Number of firms—full data (3-4-5)	86	65	14	8	7	25	205
Number of observations (10 years)	860	650	140	80	70	250	2050

**Table 2 Measurement of the variables.**

Variable	Measurement
<i>Independent variables</i>	
EBITDA	Earnings + income tax + interest + depreciation + amortization
EBIT	Earnings before interest and tax
<i>Dependent variable</i>	
Investment intensity (INV)	Total fixed assets at end-total fixed assets at beg. + depreciation
<i>Control variables</i>	
Size (S)	Total debt
Age (AG)	No. of years from establishment year to current years
Leverage (LEV)	total debt/total assets
Growth rate (GRO)	Growth of firm in terms of profitability
Growth of market share price (GP)	Growth of closing price of share
Sales growth (SG)	Growth of firm in terms of sales

**Table 3 Descriptive statistics by variables.**

Variables	Observation	Min	Max	Mean	SD
EBITDA	2050	-2.52	4.21	1.437	0.917
EBIT	2050	-1.74	4.11	1.291	0.911
S	2050	-2.3	4.52	1.774	1.073
LEV	2050	0	1.64	0.208	0.211
AG	2050	0	1.82	1.289	0.288
GRO	2050	-19	48	0.017	1.782
INV	2050	-3	1654	36.845	144.099
GP	2050	0	29	2.06	2.67
SG	2050	0	136.1	126.50	2.823

**Empirical model.** The empirical model of this study is presented in the following equation:

$$INV_{it} = \alpha + \beta_1 EBITDA_{it} + \beta_2 EBIT_{it} + \beta_3 S_{it} + \beta_4 AG_{it} + \beta_5 LEV_{it} + \beta_6 GRO_{it} + \beta_7 GP_{it} + \beta_8 SG_{it} + \epsilon_{it} \quad (1)$$

Notice: firm *I*, year *t* and  $\epsilon_{i,t}$  denote the residuals.

The primary estimation method of the regression is generalized least squares (GLS) in STATA 14. Due to the characteristics of the panel dataset (cross-sectional time series), there is a high level of confidence in the estimation of the regression.

The study uses many statistical tests to conclude the results of the model. The study uses mean and standard deviation as descriptive statistics, a normality test (skewness/kurtosis) to check the normality of the data and whether the data is normally distributed or not, variance inflation factor (VIF) to check the degree of collinearity and correlation to measure the strength of the relationship between the variables. The study also uses the Breusch–Pagan/Cook–Weisberg test for the heteroskedasticity problem and the Durbin–Watson test to find the autocorrelation problem. In addition, the study uses feasible general least-squares (FGLS) regression to increase robustness and solve the problems of diagnostic tests. In the studies using panel data, the main problem of the data is the endogeneity problem. The study uses the dynamic ordinary least-squares (DOLS) estimator through the panel data to overcome this problem. Hausman test (fixed effect and random effect) is used to overcome the problem of heterogeneity in the panel data. Finally, the dynamic panel data (DPD) model is used to remove the unobserved heterogeneity and to take into account the dynamics of changes in this model (Sumaira and Bibi, 2022). In this study, several statistical models or tests were conducted to improve the results and overcome the problems in some of these statistical models. The results of this research are robust to the use of four-panel regression models and can help investors to have a general perspective on the relationship between EBITDA, EBIT, and INV.

**Results**

**Descriptive statistics.** Table 3 describes the statistics of all variables in the GCC countries in this study.

minus total assets at the beginning of the year plus the amount of depreciation and amortization (Kotsina and Hazak, 2012). INV is a dependent variable in some prior studies, such as Hasan et al. (2013), Shojaie et al. (2018), and Novotná et al. (2020), indicating that this variable needs more tests. Table 2 shows the variables and their measurement.

This study selected six control variables to be included in the regression equation. The first is a firm size or total debt. Previous research has focused primarily on firm size and has proven that firm size and investment in fixed assets are positively related (Hashmi et al., 2020; Jamil et al., 2022; Chen et al., 2019; Vinasithamby, 2015). The second control variable is the age of the firm, i.e., the number of years since its establishment. The age of the firm has a positive effect on investment in fixed assets (Nunes et al., 2017). The third control variable is leverage, which is measured by the ratio of total debt to total assets. Leverage is used by prior studies such as Jamil et al. (2022) and Grozdic et al. (2020), who used leverage to control the relationship between investment intensity and profitability. The fourth control variable is firm growth, which is measured by profit growth. According to Fuertes-Callen and Cuellar-Fernandez (2019), growth that is not accompanied by profitability does not seem sustainable in the long term. The fifth control variable is sales growth, which is measured by the growth of sales. According to Kalash and Bilen (2021), sales growth has a positive role in mitigating leverage, as firms should increase sales levels to enhance their financial performance. The sixth and final control variable is the growth market share price, which is measured by the growth of the closing market share price. Sukesti et al. (2021) noted that the share price is a relative and proportional value of a company’s worth, which is used to attract the attention of more investors.

**Table 4 Results of Skewness/Kurtosis tests.**

	Obs.	Pr(Skewness)	Pr(Kurtosis)	chi2(2)	Prob > chi2
EBITDA	2050	0.4619	0.0106	7.08	0.0921
EBIT	2050	0.315	0.590	6.59	0.074
LEV	2050	0.3390	4.973	6.63	0.24747
AG	2050	-0.833	1.074	22.47	0.055
S	2050	0.3321	0.7331	1.06	0.5895
GRO	2050	0.26222	3.655	0.3390	0.26651
INV	2050	0.24859	0.24747	-1.045	0.85198
GP	2050	4.616	2.161	0.105	0.090
SG	2050	2.823	1.052	0.210	0.181

Table 3 shows that the mean EBITDA (1.437) is higher than the mean EBIT (1.291). The results of EBITDA and EBIT indicate that the overall financial performance of firms in GCC countries is quite high. However, the behaviors of EBITDA and EBIT are the same in all GCC countries. The mean investment intensity is 36.875, indicating that the expenditure on capital is high in GCC firms in the non-financial sector. Concerning the size of the firm, which is measured by total debt, the size is high in all GCC countries. This finding implies that firms use debts in financing their investments and assets, as this will increase the risk and cost of debts. The results of 20.8% indicate that GCC firms use debts in financing their assets with approximately 21% and 79% from owner equity. The result of the age of the firms indicates that the majority of the firms are experienced firms, as they have good experience in their sector. The mean of the growth variable is 0.017, which is low, indicating that the growth of profit is slow in GCC countries during the period of study. The means of growth of share price and sales growth are 2.06 and 126.50, respectively, which indicates that the firms have high share price growth and are able to achieve good financial performance.

**Test for normality.** The study uses skewness and kurtosis tests to check the normality of the data and whether or not the data is normally distributed. This test describes the probability distribution of a random variable around its mean. If the skewness is close to zero, then the data set is normally distributed. The results of the skewness/kurtosis test for normality are shown in Table 4.

The results of Table 4 show that the values of skewness are between -0.5 and 0.5 (except for AG) and these values are positive and the (Prob > chi2) is higher than 0.05, which means that the distribution is approximately symmetrical. On the other hand, the values of kurtosis are positive and close to the normal distribution, except for LEV and GRO. Ivanovski et al. (2015) claim that in the real world of investment and business, investors prefer the positively skewed value of earnings to the negative ones because they believe that the actual profit is higher than the expected one. On the other hand, investors prefer the lower values of kurtosis that are not far from the mean. Accordingly, the values of skewness and kurtosis of the variables in the model are reliable for further analysis.

**Variance inflation factor (VIF) and correlation matrix.** Yoo et al. (2014) pointed out that the VIF measures the strength of linear dependencies and the amount of variance of each regression coefficient. In general, a VIF value >10 can be detrimental. As shown in Table 5, the value of VIF in the model is <10, which means that the multicollinearity problem is not a concern.

**Table 5 Variance inflation factor VIF.**

Variables	VIF
EBITDA	3.28
EBIT	3.07
S	4.03
LEV	1.79
AG	1.05
GRO	1.00
GP	1.18
SG	1.09

**Correlation matrix.** Table 6 shows the correlations between the variables in the model, as measured by the Pearson correlation coefficient in the GCC countries ( $p < 1\%$ ).

Table 6 shows that the relationship between EBITDA and INV is positive and significant at 0.01 in the model, and EBIT is also positively related to INV, but the correlation of EBITDA is higher than the correlation of EBIT. The results indicate that any increase in EBITDA or EBIT will lead to an increase in INV, which has economic significance for increasing investment in the GCC countries. However, an increase in EBITDA leads to a higher increase in INV than an increase in EBIT. The relationship between INV and S is positive and significant at 0.01 in the model, indicating that investment intensity increases in large firms. Regarding the relationship between INV and LEV, the result shows a positive and significant relationship at 0.01 in the model. These results indicate that the increase in risk (LEV) leads to an increase in INV in order to achieve a high level of profit and to compensate for the high level of risk. The relationship between INV and AG (age) of the firm is negative and significant at 0.01, indicating that older firms react negatively to an increase in investment. Finally, the relationship between INV and GRO is positive but insignificant at 0.01, indicating that INV is not affected by profit growth. Finally, the relationship between INV and GP is insignificant at 0.01 and it is insignificant with SG, indicating that INV is not affected by either sales growth or market share growth.

In contrast, Table 6 shows the problem of multicollinearity. Multicollinearity is a computational difficulty that occurs when two or more independent variables are highly correlated. According to Hair et al. (2006), the presence of high correlations (generally 0.80 and above) is the first indicator of significant multicollinearity. As shown in Table 5, the correlations between the independent variables, including the control variable, are low and below 0.80, indicating that there is no multicollinearity problem for all the study variables.

**Test for Heteroskedasticity and for autocorrelation.** To make our data reliable for regression analysis, the study uses Breusch-

**Table 6 Correlation matrix.**

	EBITDA	EBIT	LEV	AG	S	GRO	GP	SG	INV
EBITDA	1.000								
EBIT	0.582**	1.000							
LEV	0.150**	0.107**	1.000						
AG	0.005	-0.006	-0.204**	1.000					
S	0.588**	0.374**	0.503**	-0.110**	1.000				
GRO	0.025	0.005	-0.004**	-0.023	-0.011	1.000			
GP	0.034	0.003	0.001	0.022	0.002	0.0003	1.000		
SG	0.021	0.002	0.002	0.010	0.001	0.0002	0.001	1.000	
INV	0.279**	0.121**	0.077**	-0.079**	0.069**	0.0282	0.002	0.001	1.000

\*\*Correlation is significant at the 0.01 level (two-tailed).

**Table 7 The results of Breusch-Pagan/Cook-Weisberg test for heteroskedasticity.**

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity	
Ho: Constant variance	
Variables: fitted values of Inv	
chi2(1)	177.37
Prob > chi2	0.0000

Pagan / Cook-Weisberg test for heteroskedasticity and it found that heteroskedasticity is present in the data of this research (chi2(1) = 177.37 and Prob > chi2 = 0.0000). Therefore, it seems that the OLS estimator is unreliable due to bias. Table 7 shows the results of the Breusch-Pagan/Cook-Weisberg test for heteroskedasticity.

On the other hand, the study examines the data against the autocorrelation problem as the study uses Durbin-Watson (DW) test. The value of the DW statistic is 1.415342 which indicates that the data has an autocorrelation problem.

**FGLS regression, DPD analysis, GLS regression, and DOLS regression.** Table 8 shows the results of FGLS, DPD, GLS, and DOLS, respectively.

**Feasible general least squares (FGLS) regression.** As the study found the problems of heteroskedasticity and autocorrelation, and to increase robustness and solve the problems of diagnostic tests, the study used feasible general least squares (FGLS) regression. FGLS measures the coefficients and covariance matrix for a multiple linear regression model in the presence of non-spherical innovations and an unknown covariance matrix Liu (2021). FGLS is more efficient than ordinary least squares (OLS) in the presence of heteroskedasticity and autocorrelation. The results of FGLS as shown in Table 8 show that EBITDA and LEV have a positive and significant effect on INV with 0.01 and 0.05, respectively, while S and AG have a negative and significant effect on INV with 0.01. However, EBIT and GRO have an insignificant effects on INV at 0.05. The results of FGLS show that there is no heteroskedasticity and no autocorrelation in the model.

**Hausman test, random effect (RE) vs. fixed effect (FE).** In order to improve the regression model and as the results of OLS are unreliable, this study uses GLS regression which is used to deal with situations where the OLS estimator is not efficient due to the problem of homoskedasticity and lack of serial correlation. To overcome the problem of heterogeneity in the panel data, the

Hausman test is used (Bibi and Sumaira, 2022 as Fixed Effect (FE) and Random Effect (RE) were used and the result of the Hausman test shows that the RE test is adopted as the significant probability is higher than 0.05 (Prob>chi2 = 0.9230) and (chi2(6) = (b-B)^[(V\_b-V\_B)^(-1)](b-B)) is 1.96.

Table 8 shows the results of the GLS random effects regression between EBITDA and EBIT and INV. According to the results in the table, the regression model is significant at 0.01, as EBITDA has a positive and significant effect on investment intensity (84.318) (p-value < 0.01). EBIT is negatively and significantly related to INV at 0.05 (-22.774) (p-value < 0.05). R2 supports the results of this model as it is equal to (0.3175). These results indicate that the increase in EBITDA leads to an increase in investment intensity and the explanatory power of EBITDA (R2) explains 31.75% of the investment intensity. Conversely, the results indicate that EBIT is not a good indicator to decide on INV and, moreover, it may give a negative indication of the impact on INV.

The analysis of the relationship between the control variables (S, LEV, AG, and GRO) and INV shows different results. S and GRO have a positive and significant effect on INV at 0.01, indicating that the larger the firm, the higher the INV meets the production requirements. GRO has a positive and significant effect on INV at 0.01. The result of GRO indicates that investments are influenced by the future direction of profitability of the firms. LEV and AG have insignificant effects on INV, indicating that these variables have no effect on INV.

**Dynamic panel data (DPD) model.** The Hausman test indicated that the GLS random effect model should be used to examine the effect of EBITDA and EBIT on INV. In order to improve the results of the GLS random effect model and to remove the unobserved heterogeneity in this model, the DPD model is used. The results of DPD as shown in Table 8 indicate that the coefficient of EBITDA is large (177.934) which is significant at 0.01, but the coefficient of EBIT (-46.202) is negative and significant at 0.01, which confirms that these two independent variables have an effect on INV.

**Dynamic ordinary least square (DOLS) model.** After correcting for heteroskedasticity and serial correlation problems, DOLS was used to increase robustness as the panel data suffered from endogeneity problems (Bassey et al., 2022). The DOLS results confirm that EBITDA has a positive and significant effect on INV at 0.01, but EBIT does not have such an effect as the coefficient is insignificant at 0.05. Also, LEV has a positive and significant effect on INV, while AG has a negative and significant effect at 0.01. Finally, S and GRO have an insignificant effect on INV.

**Table 8 Results of FGLS, DPD, GLS, and DOLS.**

	FGLS		GLS-Random		DPD (Robust)		DOLS	
	Coef.	P >  z	Coef.	P >  z	Coef.	P >  z	Coef.	P >  z
EBITDA	80.790	0.002	84.316	0.000	177.934	0.000	267.013	0.000
EBIT	-10.792	0.590	-22.771	0.046	-46.202	0.000	-58.975	0.204
LEV	165.610	0.000	40.501	0.082	85.148	0.000	174.613	0.004
AG	-47.812	0.006	4.035	0.783	12.462	0.459	-310.245	0.000
S	-23.028	0.000	14.694	0.027	19.283	0.019	-30.522	0.169
GRO	1.910	0.386	2.153	0.017	1.284	0.143	0.9108	0.799
Constant	53.788	0.035	-93.2978	0.000	-20.659	0.000		
F-value	-		8.790		-		-	
Prob > ch2	0.000		0.000		0.0000		0.000	
R <sup>2</sup>	-		0.3173		-		0.25041	
	Homoscedastic		-		-		-	
	No autocorrelation		-		One-step results		-	
Wald chi2(6)	55.33		-		440.33		320.25	
					Instruments for differenced equation			
					GMM-type: L(2/.)ebitda L(2/.)ebit			
					Instruments for level equation Standard: _cons			

In summary, EBITDA shows a consistent effect on INV as this effect is positive and significant at 0.01. This result is consistent with Pandya (2017), Jan et al. (2019), Kotsina and Hazak (2012) who find that EBITDA has a positive effect on investment intensity, indicating that in capital-intensive firms, using EBITDA as a performance indicator is preferable. On the other hand, EBIT shows different results and shows an insignificant effect under DOLS. The control variables show an inconsistent effect on INV, but under the DOLS model, both LEV and AG have a positive and significant effect on INV.

**EBITDA vs. EBIT and the impact of foreign investments.**

Foreign investment has a positive impact on economic growth in the long run (Yusuf et al., 2020; An and Yeh, 2021; Bibi and Sumaira, 2022). Countries with a better economic environment are better able to realize the benefits of foreign investment, as these countries have a higher degree of integration in global business.

Foreign investment has a positive impact on many economic variables (Jamil, 2022). Some previous studies discuss the preference for both EBIT and EBITDA from the perspective of foreign investors. Lie and Lie (2002) pointed out that the EBITDA measure provides better estimates of firm value than the EBIT measure. Financial analysts use EBIT and EBITDA as operating measures because net income information is insufficient to reveal the real performance of companies. According to Adiloğlu and Vuran (2017), both EBIT and EBITDA are better than net income because they allow investors to focus on operating profitability as a measure of performance by excluding the non-operating effects that vary from one firm to another, such as financial decisions (interest) and government decisions (taxes). Sui (2017) argues that EBITDA can discriminate between firms that look similar when judged in terms of EBIT, as EBIT tends to be more stable than operating income, and EBITDA tends to be more stable than EBIT, in business valuation. Iotti and Bonazzi (2012) discuss that the EBITDA model is considered a useful measure in explaining financial performance and the relationship between accounting and cash flow data. Rozenbaum (2019) found that the disclosure of EBITDA is useful for managers as well as investors. Furthermore, there is no evidence of opportunistic motives for managers to explain the disclosure of EBITDA.

To determine the effect of interaction among foreign investment (FI), EBIT, and EBITDA on investment intensity, the study

**Table 9 GLS of EBITDA vs. EBIT and the impact of foreign investments.**

Variables	B	Sig.
EBITDA*FI	0.00124	0.001
EBIT*FI	-0.00135	0.001

applied GLS regression per the following equation:

$$INV_{i,t} = \alpha + \beta_1 EBITDA_{i,t} * FI_{i,t} + \beta_2 EBIT_{i,t} * FI_{i,t} + \epsilon_{i,t} \tag{2}$$

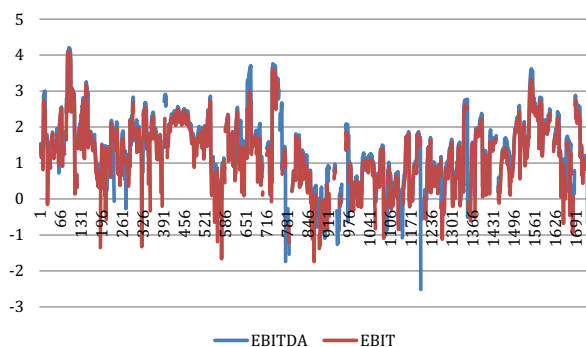
FI is the percentage of equity shares held by all foreign investors by the end of the year, and it is calculated as the total number of shares held by FI over the total number of shares outstanding. Table 9 shows the results of GLS regression.

The results show that foreign investors prefer to use EBITDA in GCC countries, as the relationship is positive and significant among EBITDA, FI, and INV, which indicates that the increase in EBITDA resulted in a higher increase in foreign investment. The relationship among EBIT, FI, and INV is negative, indicating that foreign investors did not use EBIT as an indicator to make any decision on their investment. The results indicate that foreign investors did not prefer to use EBIT as an indicator of the performance of their investments.

**Discussion**

The relationship between EBITDA and investment intensity or capital investments appears to be positive in GCC countries based on the model used in the study at the 0.01 level of significance, which is similar to previous studies. The findings of this study confirmed the main research hypothesis and empirical expectation that the relationship between capital investments and EBITDA is positive. The GCC-listed firms diversified from the oil and gas sector and then started investing in new investment projects. These investments are highly leveraged at capital-intensive firms that require considerable depreciation calculations as they have high depreciation rates and large interest payments on debt, making them focus on increasing their profit to cover these expenses. Therefore, using EBITDA rather than net income, comparing the performance of these firms in the same industry is easier. In all GCC-listed companies, EBITDA is positive during





**Fig. 1 The both profitability measures, EBITDA and EBIT, attempt to represent the cash profit generated by the firm's operation.** This indicates that the fluctuations of EBITDA and EBIT reflect the fluctuations in the firm's operation.

the sample period, although it fluctuates in some years, which indicates that the goals of these investments are achieved. These results encouraged owners to increase investments in infrastructure in GCC countries. EBIT has the same direction as EBITDA despite being less than EBITDA and having more fluctuations. Figure 1 shows the directions of both EBITDA and EBIT during the period of the study in GCC countries.

Conversely, EBIT does not seem to be a good indicator in GCC countries. EBIT and investment intensity are negatively related and do not give a positive signal on investment intensity. One reason behind this finding is the inclusion of the depreciation of fixed assets in calculating EBIT, as it can lead to varying results when compared with firms in different industries and different countries. The amount of depreciation and amortization in the listed firms is high. Therefore, EBITDA is more than EBIT in all these firms. This finding shows that EBITDA represents operating cash flow better than EBIT because EBITDA removes the effect of depreciation and amortization.

The results illustrate that foreign investors prefer to use EBITDA in deciding investment intensity. This preference is explained by the fact that foreign investors assess the ability of the firm to generate cash, and EBITDA represents a good approximation of cash. This finding is in line with the studies of Cassis (2002). The results show that this relationship is indeed increased in the leveraged firms in comparison with less leveraged firms, and leverage has a positive effect on INV in these countries, providing a balance between risk and return.

## Conclusion

This study aims to examine the association between Earnings before Interest, Tax, Depreciation, and Amortization (EBITDA), Earnings before Interest and Tax (EBIT) and investment intensity in GCC countries. Additionally, this study aims to test whether foreign investors prefer to use EBITDA or EBIT in deciding investment intensity. The study employs two non-GAAP profitability measures because most stakeholders, such as foreign investors, prefer to use non-GAAP measures to show the results of firm performance.

The results of the study indicate that EBITDA has a statistically positive impact on investment intensity in GCC countries at 0.01. The results show that EBIT has a statistically negative impact on investment in these countries. The results indicate that investment intensity is positively influenced by EBITDA, in line with the study of Kotsina and Hazak (2012). Therefore, this study recommends considering EBITDA in deciding the investment intensity.

The results of this study filled the research gap in the area of investment intensity, as the study provided empirical evidence from one business environment that has not been addressed before. This evidence enhances the idea of the importance of non-GAAP measures in deciding about investment intensity.

The study can guide investors, policymakers, and managers. First, policymakers and regulators should devise a measurement of EBITDA and EBIT that can be used to regulate and control it, as it will raise market confidence and enhance the relationship between accounting information and market equity. The disclosure of EBITDA and EBIT metrics is crucial for the success of future reforms to improve market efficiency, investor protection, and investments in emerging economies, such as the GCC. The results of this study suggest that managers should develop and maintain high-quality disclosure of investment and profitability that provides a general framework for using non-GAAP (IFRS) measures along with GAAP (IFRS) measures. Stakeholders are interested in more relevant and reliable information. Therefore, regulators of the capital market should use profitability information as guidelines to improve investment intensity decisions to enhance the allocation of resources in capital markets. This study has some limitations. First, the study uses firm financial reports to measure the main variable of the study. Second, it only focuses on one measure of investment intensity, which is the change in tangible assets. Other measures of investment intensity may yield different results and provide additional insights into investment intensity. Third, it only investigates the potential association between Investment intensity and profitability and does not establish any causal relationship between them, as investment intensity can affect profitability and vice versa. However, this study does not address this relationship. Finally, the study might not be generalized to other regions, but it adds some value, as its findings suggest several interesting associations.

## Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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### Competing interests

The authors declare no competing interests

### Ethical approval

This article does not contain any studies with human participants performed by any of the authors.

### Informed consent

This article does not contain any studies with human participants performed by any of the authors.

### Additional information

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