

Simultaneous Equation Estimation in Finance and Corporate Financial Decision: Empirical Evidence from Pakistan Stock Exchange

Wahab AHMED¹, Hadi Hassan KHAN², Abdul RAUF³, SM Nabeel ULHAQ⁴, Safia BANO⁵, Bilal SARWAR⁶, Shams ul HUDA⁷, Mirwaise KHAN⁸, Ahmed WALI⁹, Maryam Najeeb DURRANI¹⁰

Received: November 20, 2020 Revised: January 25, 2021 Accepted: February 03, 2021

Abstract

In the last few years, there is growing interest in the field of simultaneous equation estimation in finance due to the endogeneity problem caused by measurement errors, simultaneity, or omitted variables. This study aims to discuss the endogeneity problem in corporate financing decisions and investigate the interrelationship of financial decision-making such as investment decision, dividend decision, and external financing decision in Pakistan Stock Exchange (PSX) using two-stage least squares (2SLS) and generalized method of moment (GMM) estimation. The Bruech-Pagan test shows that the data has no heteroskedasticity issue and 2SLS is a better approach in the context of this study as compared to the GMM approach, and internal instruments are also sufficiently strong and valid. The three financial decision-making attributes are not jointly determined, and the dividend is influenced by one-sided investment. In the emerging stock market context, external financing and investment are not inter-related and did not affect each other. The question of whether the simultaneous equation estimation can be useful in the context of the emerging stock markets and newly-growing firms remains unanswered. The inclusive evidence shows that the theoretical link in the emerging stock market is difficult to prove like in developed stock markets.

Keywords: Corporate Financial Decisions, Simultaneous Equation, 2SLS, GMM

JEL Classification Code: C33, C36, G11, G32

1. Introduction

Theory and evidence suggest that corporate financial decisions comprise three characteristics: investment, dividend, and external financing decisions (Chance, 2019; Kirch & Terra, 2019; Yuniningsih, Pertiwi, & Purwanto, 2019). Many researchers have investigated investment,

¹First Author. Lecturer, Department of Management Sciences, Muslim Bagh Campus, Balochistan University of Information Technology Engineering & Management Sciences, Quetta, Pakistan.
Email: wahhabahmed2017@gmail.com

²Corresponding Author. Assistant Professor, Department of Management Sciences, Faculty of Management Sciences, Balochistan University of Information Technology Engineering & Management Sciences, Quetta, Pakistan [Postal Address: City Campus, Jinnah Town, Samungli Road, Quetta, Balochistan, 87200, Pakistan]
Email: hadihassankhan@gmail.com

³Lecturer, Department of Management Sciences, Muslim Bagh Campus, Balochistan University of Information Technology Engineering & Management Sciences, Quetta, Pakistan.
Email: abdraufkhan31@gmail.com

⁴Assistant Professor, Department of Economics, Faculty of Management Sciences, Balochistan University of Information Technology Engineering & Management Sciences, Quetta, Pakistan.
Email: sm.nabeel@buitms.edu.pk

⁵Assistant Professor, Institute of Management Sciences, University of Balochistan Quetta, Pakistan. Email: sb_ims@yahoo.com

⁶Assistant Professor, Department of Management Sciences, Faculty of Management Sciences, Balochistan University of Information Technology Engineering & Management Sciences, Quetta, Pakistan.
Email: bilal.sarwar@buitms.edu.pk

⁷Deputy Director Accounts, Balochistan University of Information Technology Engineering & Management Sciences, Quetta, Pakistan.
Email: shams.qta@gmail.com

⁸Department of Management Sciences, Faculty of Management Sciences, Balochistan University of Information Technology Engineering & Management Sciences, Quetta, Pakistan.
Email: mirwaisekhankakar@gmail.com

⁹Department of Management Sciences, Faculty of Management Sciences, Balochistan University of Information Technology Engineering & Management Sciences, Quetta, Pakistan.
Email: contactofahmed@gmail.com

¹⁰Department of Management Sciences, Faculty of Management Sciences, Balochistan University of Information Technology Engineering & Management Sciences, Quetta, Pakistan.
Email: maryam.durrani.40050@gmail.com

dividend, and external financing as interrelated contemporary determinants (Lee, Liang, Lin, & Yang, 2016). Elettra Agliardi, Rossella Agliardi, and Willy Spanjers (2016) used a behavioral approach to investigate the capital structure, dividend, and liquidity demand decisions. Yuniningsih et al. (2019) advocated that financial decisions are majorly impacted by financial constraints. The three characteristics of corporate financial decisions: investment, dividend, and external financing are the main focus of this study by using the simultaneous equation estimation, two-stage least squares (2SLS), and generalized method of moments (GMM) (Bennett, Kallus, & Schnabel, 2019).

Finance literature has widely adopted simultaneous equation models (Lee et al., 2016). Many studies were empirically analyzed by Kirch and Terra (2019), Acharya, Almeida, and Campello (2007), and Almeida and Campello (2007). The three characteristics of corporate financial decisions: investment, dividend, and external financing have been given extensive consideration in the financial literature, becoming a more valuable task in corporate finance. Policymakers and board of directors of the firms have a deep interest in new research developments for making extensive policies, determining optimal cost of capital, and capture new opportunities.

Antecedent researchers have analyzed relationships among major financial decisions (Dhrymes & Kurz, 1967; E. Fama, 1974; G. McCabe, 1979; McDonald, Jacquillat, & Nussenbaum, 1975; Mueller, 1967; Peterson & Benesh, 1983). Highlighting the interdependence, Mueller (1967, p. 58) quotes “a complete understanding of this decision process can be obtained only by explicitly accounting for the numerous interactions which are a result of this simultaneity.”

The financial decision about leverage is a trade-off between the cost-benefits analysis of external financing (PHAN & NGUYEN, 2020). Yuniningsih et al. (2019) emphasized the proper analysis of benefits and costs incurred while making funding decisions. Omodero and Ogbonnaya (2018); Basheer*, Khan, Hassan, and Shah (2018) and Ali et al. (2016) take reference from pecking order theory and state that firms’ financial decisions depend on firms retained earnings. Hidthiir, Basheer, and Hassan (2019) investigated the simultaneity effect of leverage on cash holding. Supporting Agency theory, pecking order theory, and signaling theory concluding that financial decisions such as cash holdings, financing, and investment decisions have a significant impact on each other (Hidthiir et al., 2019).

Agency Theory (Panda & Leepsa, 2017), Pecking Order Theory (Martinez, Scherger, & Guercio, 2019), and Trade-off Theory (Nwamaka & Ezebasili, 2017) are the commonly-accepted theoretical lenses adopted by researchers to analyze financial management determinants (Kirch & Terra, 2019). The agency conflicts (between the managers and the shareholder) and the potential for conflict between the shareholders and bondholders are also counted

as a cost of debt financing over the opportunity to invest and financing decisions for the corporations. In the case of debt financing, optimal incentive can be controlled through a variety of contracting mechanism; this is most important for high-growth firms because these firms are more likely to face shareholder and bondholder conflicts (M. C. Jensen & Meckling, 1976; Myers, 1977; Smith & Warner, 1979).

E. F. Fama and French (2001) argued that profitability, investment opportunity, and size of the corporation affect the dividend-paying decisions. Large-size corporations and high profitability cause to pay more dividend, and the high opportunity to invest discourages corporations from paying dividends. They also addressed the dividend payout decisions of newly-developed and mature corporations. Brav, Graham, Harvey, and Michaely (2005) also explored the same phenomena through survey research with additional factors like; the role of taxes, agency considerations, and a signal of dividend-paying to investors; concluding that dividend payout decision is the second consideration only after investment and liquidity requirements. Many firms choose dividend payout as a repurchase of shares as compare to giving a cash dividend (Grullon & Michaely, 2002; Jagannathan, Stephens, & Weisbach, 2000), and same time why few firms still pay substantial dividends (Allen & Michaely, 2003; DeAngelo, DeAngelo & Skinner, 2004).

In finance, simultaneous equation estimations are frequently used due to the endogeneity problem. The interrelationship among the capital structure, external financial decisions, corporate investments, dividend payout decisions, ownership structure, corporate governance, stock return, firm characteristics, and other issues related to corporate decisions are co-determined and jointly have a significant effect. MacKay and Moeller (2007) investigated the relationship simultaneously between corporate hedging and the value of the firm. Gong, Louis, and Sun (2008) investigated the cause-consequence relationship through a system of equations, among the repurchases of shares and earnings. Harford, Klasa, and Maxwell (2014) examine the interdependence of cash holdings and debt maturity. Advancing previous literature, current study simultaneously analyzes the fundamental three variables of financial management investment, dividend, and external financing decisions, examining the interdependence among these endogenous and exogenous variables.

Lee et al. (2016) discussed the simultaneous equations estimations in the finance literature through reviewing different research and conclude that the endogeneity problem has a significant effect on the corporate decision-making process. They also examine the interdependence among the financing, investment, and dividend payout decision through simultaneous equations by two-stage least squares (2SLS), three-stage least squares (3SLS), and generalized method of moments (GMM) estimations (Lee et al., 2016). Their results showed interdependence between investment, financing, and

dividend payout decision, and these corporate decisions are also co-determined and should account for simultaneous equations estimations.

The finance literature has widely adopted simultaneous equation models (Lee et al., 2016). Simultaneity financial decisions were empirically analyzed (Acharya et al., 2007; Almeida & Campello, 2007; Kirch & Terra, 2019). The existence of the endogeneity problem is acknowledged by the literature stream, endogeneity problem may be caused due to omitted variables, measurement error, and reverse causality (Lee et al., 2016). The ordinary least squares (OLS) estimation, in this case, yields biased and inconsistent estimates due to the correlation between the explanatory variables and error term, and the assumption that OLS is violated. The instrumental variable methods are used to eliminate the problem of endogeneity (Pivato, Misani, & Tencati, 2008). Two-stages least squares and three-stage least squares estimations deal with instrumental variables estimations. Hansen (1982) proposed a generalized method of moments (GMM) estimators, which is a further generalization of (Sargan, 1959). GMM estimates through weighting matrix, which accounts for temporal dependence or heteroskedasticity. We used *F*-statistics from first-stage regression for the instruments weakness test and Pagan and Hall (1983) for testing the heteroskedasticity.

The increase in external financing may increase cash available for investment (Alnori & Bakry, 2020). The corporate decisions of external financing will lead management to change their policies related to debt, working capital, and so on. Ancient examines the interdependence among the corporate capital structure, investment, and dividend payout decisions and conclude that these corporate decisions are significant and simultaneously determined (Aggarwal & Kyaw, 2010; E. Fama, 1974; E. F. Fama & French, 2002; Grabowski & Mueller, 1972; Gugler, 2003; Harford et al., 2014; Higgins, 1972; MacKay & Phillips, 2005; G. M. McCabe, 1979; Mougoue, 2008; Switzer, 1984).

The current study aims to examine the interdependence between the firm's investment, external financing, and dividend payout decision by using two-stage least squares (2SLS), and generalized method of moment (GMM) estimations. We collect 134 listed firms from the Pakistan Stock Exchange (PSX) from 2003 to 2019. The results of Pagan and Hall (1983) conclude that the data is homoscedastic and the validity of instrumental variables (IVs) is shown that instruments are sufficiently strong and valid.

2. Literature Review

The corporate decisions and investment behavior of firms are extensively studied for many decades. The desegregation of neo-classical theory and investment theory of the firm has been analyzed by Roos (1927), Tinbergen (1938), Tinbergen (1940), and Theil (1961) and more comprehensive work done by Eisner

and Strotz (1963); studies may give accurate results which contribute empirical applicability of the capacity- accelerator or rate of profit theories of investment.

Yuniningsih et al. (2019) analyzed financial management decisions with exogenous controlling variables that indirectly affect firms' performance; these variables include profitability, ownership, company size, company growth, and liquidity. Analysis of financial decisions based on the estimating system of the equation includes predetermined and exogenous explanatory variables (Chang, Dasgupta, Wong, & Yao, 2014; Gatchev, Pulvino, & Tarhan, 2010; Noe, Dasgupta, & Wang, 2011). Using a behavioral approach Elettra Agliardi, Rossella Agliardi, and Willem Spanjers (2016) modeled financial decisions under ambiguity aversion; concluding it has a first-order impact on joint capital structure, dividend decisions, and liquidity demand decisions. Kirch and Terra (2019) suggest that financial constraints highly impact companies financial decisions; promoting the interdependence among cash holding dividends, financing, and investment decisions. The controversy about corporate decisions and inter-dependency among corporate decisions is still needed to be explored further.

Investment objectives and investment decisions are parallel to each other (Yuniningsih et al., 2019). Firms' value is affected by dividend payments (Budagaga, 2017). Organizations' objectives are balanced with short-term and long-term objectives (Yuniningsih et al., 2019). Nwamaka and Ezeabasili (2017) state that short term objectives focus on profit maximization while long-term objectives focus on company value maximization. Furthermore, Rizqia, Aisjah, and Sumiati (2013) suggest that firms' value is influenced by both dividend policy and investment opportunity. Yuniningsih et al. (2019) state that both internal and external factors must be examined while making short-term and long-term investment decisions, weaving a suitable mix of funding, investing, and external financing policies. The corporate decisions related to increasing capacity to invest and making a profit, that increase the wealth of shareholders, are very important because they are co-related to each other.

The sequence of these corporate decisions; investment, dividend payout decision, and external financing are probably crucial to explore and need a further extension in the literature that gives satisfactory empirical results. Yuniningsih, Hasna, Wajdi, and Widodo (2018) suggest financial managers must consider both internal and external aspects while determining dividend distribution policy. Budagaga (2017) and Anton (2016) found a positive influence of dividends on a firm's value. The dividend payout behavior depends on profits and past payout trends (on lags). The investment decision model is essentially is the adoption of a usual flexible model of payout decision which is also desired as the dividend payout ratio (Baker & Weigand, 2015; Che-Yahya & Alyasa-Gan, 2020). External finance behavior depends on the requirement of the

budget for investment expenditures; both financial (financial statements) and non-financial (behavioral factors) influence investment decisions (Yuniningsih et al., 2018).

Investment behavior depends on retained earnings, dividend payout, and external financing; the direction of reverse causality is certain in this context. Dividend behavior depends on profits, growth opportunity, past payout (lagged dividend), and external financing (debt); and external financing depends on investment and dividend payout decision (Sulastrri & Isnurhadi, 2020). Corporate decisions are made considering the firms' goals and environment at the time of the decision-making process (Siegrist, Bowman, Mervine, & Southam, 2020). In the perspective of Taiwan and China, D. H. -M. Wang (2010) suggests that firms adopt different financial strategies concerning their unique environment.

The endogeneity problem mostly exists in corporate decisions due to interdependency in capital structure decisions simultaneous equation estimations are applying frequently (Lee et al., 2016). Hidthiir et al. (2019) determined the existence of the endogeneity problem by performing the Wu Hausman test (Sheikhi, Bahador, & Arashi, 2020). In the beginning, Kuh (1963) explored the interdependency between the investment, dividend payout decision, and external financing of corporate behavior theoretically and empirically. He combined the capacity-accelerator model with Lintner (1956) model of dividend behavior and linked these three corporate decisions and their dependency as theoretically. The theoretical model was quite clear, developed, and integrated, but empirically the model was not quite clear.

The literature on simultaneous equation estimation shows a variety of approaches. Lee et al. (2016) further investigate Dhrymes and Kurz (1967) model by using two-stage least squares (2SLS), three-stage least squares (3SLS), and generalized method of moments (GMM) estimations and give empirical support of these corporate decisions. They conclude these three characteristics have an interdependent and simultaneous effect. Billett, KING, and Mauer (2007) propose the corporate financial policies, which are jointly determined, and they investigate these policies – leverage, debt maturity, and covenants by GMM estimation – simultaneously, and they summarized and concluded that in high-growth firms, agency cost of debt can decrease by covenants.

Furthermore, Berger and Di Patti (2006) demonstrate agency cost hypothesis have simultaneous effect or leverage affect the performance of firm and capital structure decision also affected by the performance of the firm. The interdependency between performance and capital structure they use 2SLS and 3SLS estimation to sort the problem of reverse causality. Hidthiir et al. (2019) get the same results that high leverage is associated with higher profit. Harvey, Lins, and Roper (2004) identified the endogenous relationship between ownership structure, debt, and value of the firm by 3SLS estimation. They conclude, in

the emerging market debt of the firm can allay agency and information problems.

Harford et al. (2014) investigate the interrelationship of a firm's cash holding and maturity of debt by using 2SLS and find a significant relationship among them. Ruland and Zhou (2005) similarly estimate the potential endogeneity among the firm excess value and leverage and conclude by using 2SLS estimation that in comparison with diversified firms, specialized firms decrease with leverage. Aggarwal and Kyaw (2010) identified the interrelationship among dividend policy and capital structure by using 2SLS and interpret the results that domestic companies have significantly higher debt ratios and pay fewer dividends than multinational companies. MacKay and Phillips (2005) find that in the industry, financial structure, technology, and risk are co-determined by using GMM.

To investigate the interdependence between the extensive policies of the firms, Higgins (1972), E. Fama (1974) and Morgan and Saint-Pierre (1978) investigate the interrelationship among dividend decisions and investment decisions. Furthermore, Grabowski and Mueller (1972) investigate the interdependence between dividend, investment, and research and development. E. F. Fama and French (2002) examine the relationship between dividend and financing. Moreover, previous research has demonstrated that the investment decision has an interrelationship with financing and dividend decision (Dhrymes & Kurz, 1967; G. M. McCabe, 1979; McDonald et al., 1975; Peterson & Benesh, 1983; Switzer, 1984).

3. Methodology

3.1. Instruments and Heteroskedasticity Test

The existence of the endogeneity problem is acknowledged by the literature stream. Endogeneity problem may be caused by measurement errors, simultaneity, or omitted variables (Lee et al., 2016). To tackle the problem of reverse causality and inter-relationship we are using two estimation approaches, 2SLS and GMM as simultaneous equations (Lee et al., 2016). 2SLS and GMM estimations are to use the variables as the instrumental variable as a two stages process (Yuniningsih et al., 2019). According to Staiger and Stock (1994), Bound, Jaeger, and Baker (1995), and Stock and Yogo (2005), weak instruments will not give ideal results and will mislead the estimation results. The selection of instruments is critical and very important for the estimation.

For measuring the strength of instruments and validity we using the *F*-statistics test and first-stage least squares regression analysis by checking the null hypothesis that the instruments are jointly significant to zero and also check the value of R^2 following (C. -J. Wang, 2015). In the presence of heteroskedasticity, most of the researchers use the GMM

estimation technique, because this estimation gives more reliable results when the error term is heteroscedastic (Srivastava, 2020). The Pagan and Hall test is to detect heteroskedasticity in the data and is also a robust approach in our context (Babashova, 2020). The traditional approach to test the heteroscedasticity is not suitable for simultaneous equation estimation. We use instrumental variables in this model so the Brunch-Pagan test or Cook-Weisberg test is not a good choice (Pagan and Hall (1983), Hashem Pesaran and Taylor (1999).

3.2. Variables, Data, and Model

The major financial decisions of any firm are investment decisions, dividend payout decisions, and external financing decisions. We using the simultaneous equation method to find out the interrelationship among these three financial decision behavior of the firm in the Pakistan Stock Exchange (PSX) by 2SLS and GMM. Most of the Previous studies take into account these approaches from the last many decades because the endogeneity problem in finance has vast evidence support.

We have a sample of 134 firms' data for twelve years from the Pakistan Stock Exchange (PSX). The unbalanced panel data is using because Pakistan is an emerging market and most of the firms came late into the listing of SECP. We consider only those firms who have a minimum 15-year record of any variable and a maximum of twelve years. The data of listed firms of PSX are annually and collected from the data stream from 2003 to 2019. We exclude all financial firms like commercial and Islamic Banks, insurance companies, securities investment companies, futures contracts, and modarabas companies, as mentioned in previous research (Cook & Tang, 2010; E. F. Fama & French, 2002; Huang & Ritter, 2009). The simultaneous equation estimations are;

$$\text{Invst}_{it} = \alpha_{1i} + \alpha_{2i}\text{Divd}_{it} + \alpha_{3i}\text{TI/Ta}_{it} + \alpha_{4i}\text{Invst}_{i,t-1} + \alpha_{5i}\text{SI}_{it} + \varepsilon_{it} \quad (1)$$

$$\text{Divd}_{it} = \beta_{1i} + \beta_{2i}\text{Invst}_{it} + \beta_{3i}\text{TI/Ta}_{it} + \beta_{4i}\text{Divd}_{i,t-1} + \beta_{5i}\text{P}_{it} + \eta_{it} \quad (2)$$

$$\text{TI/Ta}_{it} = \lambda_{1i} + \lambda_{2i}\text{Invst}_{it} + \lambda_{3i}\text{Divd}_{it} + \lambda_{4i}\text{TI/Ta}_{i,t-1} + \lambda_{5i}(\text{lnAsst}_{i,t-1}) + \lambda_{6i}(\text{EBIT}_{i,t-1}/\text{Asst}_{i,t-1}) + \xi_{it} \quad (3)$$

In the simultaneous equation approach, we have three endogenous variables, investment (Invst), dividend (Divd), and financing (TI/Ta) and three equations of estimation for each financial decision behavior as the dependent variable in each estimation equation. And in each equation rest of

the two endogenous variables entered as an explanatory variable. In three equations, there are other exogenous variables: sales (SI), net income available to common stockholder (P), natural log lagged assets (lnAsst), and the ratio of earnings before interest & taxes and lag of assets (EBIT/Asst), with effect on a particular endogenous variable in the estimating equation. These three financial decisions use as endogenous variables: investment (Invst_{it}), leverage (TI/Ta_{it}), and dividend (Divd_{it}) of the *i*th firm in *t*th year. The Divd and Invst are calculated as per share as mentioned by (E. Fama, 1974) in his paper. Invst is net property, plant and equipment, and Divd are calculated as dividends received by commons stockholders. For the leverage TI/Ta, we calculate the ratio of total liabilities divided by total Assets as a proxy for leverage (E. F. Fama & French, 2002; Zaher & Illescas, 2020).

The other exogenous variables that we use in the model are: sales (inventories for calculating sales variable), net income available to the common stockholder (net income minus preferred dividends), total assets, total liabilities, and lag term of endogenous variable. We use these exogenous variables sales (sales plus the change in inventories) SI_{it} and net income available to the common stockholder (P_{it}), from the research of E. Fama (1974) in Invst and Divd equations. Furthermore, two other exogenous variables are natural log of lag of total assets (lnAsst_{i,t-1}) and the ratio of earnings before interest and taxes to total assets (EBIT_{i,t-1}/ASST_{i,t-1}) following (E. F. Fama & French, 2002).

3.3. Empirical Results and Discussions

Table 1 shows the results of the first-stage least squares *F*-statistics and Pagan and Hall (1983) test values. *F*-statistics shows the weak instrument, whether instrumental variables are better to use or not. The rejecting PB-test is the value of rejecting the null hypothesis of the test and shows that the data is heteroskedastic.

The results of the *F*-Statistics are highly significant and the exogenous variables are valid to estimate. The *R*² for all three variables are 0.711, 0.383, and 0.778 for investment, dividend, and external financing decisions, respectively; these instruments are sufficiently strong. The PB-Test null hypothesis for constant variance (Homoskedastic) for three variables is 0.131, 0.167, and 0.201, thus unable to reject the null hypothesis and conclude that the error term is homoskedastic. The error term is homoskedastic so the instrumental variables models 2SLS and GMM give approximately the same results.

The simultaneous equation estimates two-stages least squares (2SLS) model; the results are shown in Table 2. The estimated coefficients of investment, dividend, and external financing decisions are directly obtained, these can be taken through an average of individual firms.

In the first estimation of investment as an endogenous variable, the coefficient of lagged investment is significant and has a positive relationship with investment and other exogenous variables; dividend, leverage have a positive significant relationship with investment. The positive relationship between investment and external financing shows that the higher the investment opportunity higher the external financing and less opportunity to investors tend to managers to borrow less amount. Similarly, Ross (1977) and Myers and Majluf (1984) demonstrated the preference for debt financing over equity financing.

Hussain et al. (2020) state an investment opportunity they like to borrow money from external sources because it will generate high cash flow in the future for the firm and pay the debt will be easy. The dividend and investment positive relation show that a firm with a higher investment opportunity has a higher cash flow and causes to increase in dividend payout (McDonald et al., 1975; Yoon & Starks, 1995). Our finding is opposite as significant and positive to the finding of investment and external financing (Froot, Scharfstein, & Stein, 1993; John & Nachman, 1985; Lee et al., 2016; McDonald et al., 1975).

Table 1: Instrumental Variables and Heteroskedasticity Test

	Invst _{it}	Divd _{it}	TI/Ta _{it}
F-Statistics	23.93(0.000)***	7.04(0.000)***	32.45(0.000)***
R ²	0.7176	0.392	0.7883
Adjusted R ²	0.711	0.383	0.7786
PB-Test	(0.131)	(0.201)	(0.167)

The *p* values are in the parentheses with, (10%)*, (05%)** and (01%)***. we run first stage *F*-statistics of the model endogenous variable on all exogenous variables and obtained *F*-statistics and R². The *F*-statistics null hypothesis is that the instruments are jointly equal to zero. The *PB*-Test shows the rejection of the Pagan-Hall test null hypothesis of Homoskedasticity in data at a 5% significant level of investment, dividend, and external financing decision policies respectively.

Table 2: Results of Two Stages Least Square (2SLS)

Independent Variables	Dependent Variables (Exogenous variables)		
	Invst _{it}	Divd _{it}	TI/Ta _{it}
Constant	8.2(0.63)	0.708(0.272)	0.05(0.17)
Invst _{it-1}	0.824(0.010)***		
Divd _{it-1}		0.829(0.000)***	
TI/Ta _{it-1}			0.8731(0.000)***
Invst _{it-1}		0.013(0.000)***	-2.47E-05(0.477)
Divd _{it}	0.629(0.28)		0.00024(0.296)
TI/Ta _{it}	4.8(0.44)	-0.80(0.40)	
SI _{it-1}	-2.02E-08(0.54)		
P _{it}		6.10E-08(0.0841)*	
lnAsst _{it-1}			0.0022(0.42)
EBIT _{it-1} /Asst _{it-1}			-0.17(0.000)***
R ²	0.757	0.683	0.799
Adjusted R ²	0.756	0.682	0.798

The *p* values are in the parentheses with, (10%)*, (5%)** and (1%)***. The results of the 2SLS estimation model for investment, dividend, and external financing. $Invst_{it} = \alpha_{1i} + \alpha_{2i}Divd_{it} + \alpha_{3i}TI/Ta_{it} + \alpha_{4i}Invst_{i,t-1} + \alpha_{5i}SI_{it} + \varepsilon_{it}$, $Divd_{it} = \beta_{1i} + \beta_{2i}Invst_{it} + \beta_{3i}TI/Ta_{it} + \beta_{4i}Divd_{i,t-1} + \beta_{5i}P_{it} + \eta_{it}$, $TI/Ta_{it} = \lambda_{1i} + \lambda_{2i}Invst_{it} + \lambda_{3i}Divd_{it} + \lambda_{4i}TI/Ta_{i,t-1} + \lambda_{5i}(lnAsst_{i,t-1}) + \lambda_{6i}(EBIT_{i,t-1}/Asst_{i,t-1}) + \xi_{it}$.

Table 3: Results of Generalized Methods of Moment (GMM)

Independent Variables	Dependent Variables (Exogenous variables)		
	Invst _{it}	Divd _{it}	TI/Ta _{it}
Constant	4.689(0.03)**	0.68(0.397)	0.0462(0.398)
Invst _{it-1}	1.033(0.0000)***		
Divd _{it-1}		0.912(0.000)***	
TI/Ta _{it-1}			0.907(0.000)***
Invst _{it-1}		0.0094(0.179)	-2.45E-06(0.946)
Divd _{it}	0.2181(0.1141)		2.34E-05(0.001)***
TI/Ta _{it}	-1.953(0.71)	-0.709(0.47)	
SI _{it-1}	-1.04E-08(0.085) [†]		
P _{it}		4.31E-08(0.145)	
lnAsst _{i, it-1}			0.0036(0.308)
EBIT _{i, it-1} /Asst _{i, it-1}			-0.464(0.000)***
R ²	0.92001	0.7308	0.8653
Adjusted R ²	0.9197	0.7299	0.8647

The *p* values are in the parentheses with, (10%)*, (5%)** and (1%)***. The results show the GMM estimation model for investment, dividend, and external financing. $Invst_{it} = \alpha_{1i} + \alpha_{2i}Divd_{it} + \alpha_{3i}TI/Ta_{it} + \alpha_{4i}Invst_{i,t-1} + \alpha_{5i}SI_{it} + \varepsilon_{it}$, $Divd_{it} = \beta_{1i} + \beta_{2i}Invst_{it} + \beta_{3i}TI/Ta_{it} + \beta_{4i}Divd_{i,t-1} + \beta_{5i}P_{it} + \eta_{it}$, $TI/Ta_{it} = \lambda_{1i} + \lambda_{2i}Invst_{it} + \lambda_{3i}Divd_{it} + \lambda_{4i}TI/Ta_{i,t-1} + \lambda_{5i}(lnAsst_{i,t-1}) + \lambda_{6i}(EBIT_{i,t-1}/Asst_{i,t-1}) + \xi_{it}$.

Finally, the third simultaneous equation estimates external financing as an endogenous variable; results show that investment and dividend have no significant effect on external financing. The investment has very small negative and the dividend has small positive, but insignificant coefficients (Yuningsih et al., 2019). The exogenous variable natural log of total assets has a positive coefficient but it is insignificant. The positive significant results show large firms borrow more external financing than small firms (Nguyen, Dang, Phan, & Nguyen, 2020).

The variable, ratio of EBIT to the lagged of total assets has a small negative coefficient and has significant results with external financing, which indicates the relationship that when the firms have higher internal earnings than they do not like external financing because of their incentive on external financing is lesser than internal financing. All three lagged term of the endogenous variable have a positive and significant effect (Sudiyatno, Puspitasari, Suwanti, & Asyif, 2020).

The relation with sales plus change inventory has an insignificant and negative very small impact on investment. In the second simultaneous equation estimates dividend as an endogenous variable show, external financing has a highly significant and positively small effect on the dividend (Lee et al., 2016). This shows the dividend has no

relationship with investment, but investment has a positive relationship with the dividend, consistent with the finding of (Lambrecht & Myers, 2012). And external leverage has a negative insignificant effect on dividend because, when the firm acquire less external financing resources, they can be able to pay more dividend (E. F. Fama & French, 2002; G. R. Jensen, Solberg & Zorn, 1992). The exogenous variable, net income available to common stock, has a very small, but positive coefficient and has a slightly significant effect on the dividend. The significant positive relation between *Pit* shows firms pay a dividend when they have high net income available to their common shareholders.

The overall estimated results are summarized in Table 3, and the results of GMM estimates are very similar to the finding of 2SLS estimation. The significance of some of the variables are changed; the dividend is significant with external financing with a small coefficient with a highly significant value of 0.001, and investment is found insignificant with dividend decision in GMM estimation. Lee et al. (2016) found that if the error term is homoscedastic then the results of 2SLS, 3SLS, and GMM are the same. For the small sample size, GMM estimation will not provide better results as it requires a large sample size because it is a function of four moments and 2SLS and 3SLS is a better approach in a small sample than GMM estimation

and GMM will be useful at the time of heteroskedasticity (Hayashi, 2000). The previous discussion showed that all lagged endogenous variables and exogenous variables have the same sign and same effect on investment, dividend, and external financing. The value of R^2 and adjusted R^2 is quite acceptable and the model is explaining a large amount of variation from 68% to 80% approximately.

4. Conclusion

The main purpose of this research paper was to investigate the simultaneous equation estimation and endogeneity problem in the view of prior studies and apply this estimation method in the context of Pakistan as an emerging market by using 2SLS and GMM (Lee et al., 2016). The results show that there is no interrelationship between the investment decision and dividend decision, but there is an interrelationship between the dividend decision and investment decision. The dividend is influenced by investment decision and somehow exogenous variable P_{it} in both estimations 2SLS and GMM. The results also show that there is no interdependence between the investment decision and extra financing decision (Yuniningsih et al., 2019). The external financing decision also is not affecting dividend decisions, but the relationship of external financing is insignificant, but negative coefficient with the dividend. The exogenous variable earning for the common stock has a negative and significant effect on external financing.

Based on our findings, the research is not showing the interdependence of three decision behaviors. Thus, the following conclusion can be drawn that investment and external financing do not have an effect on one another, but this investment has a significant effect on dividend decision. Out of three exogenous variables, two of them, Pit and ratio of earnings before interest and taxes to total assets, have a significant effect on endogenous variables. All the lagged terms of endogenous have also significant relation to an endogenous variable.

Summing up the results it can be concluded that there is not as such interdependency among these three financial decision behaviors of Pakistani firms in the Pakistan Stock Exchange. It may be possible that these firms are still in a growth phase and may not be able to generate external finance easily or growth opportunities in bad economic conditions (Jansen, 2016). Maturity or long survival may make it easy for the firm to make financial decisions flexible. Brav et al. (2005) show that, when the firm is mature, it is more likely to buy back its share and increase the earnings per share instead of dividend payout. Most of the study demonstrates that there is no inter-dependency among this financial behavior, but it needs to be more investigate in the context of Pakistan and emerging countries in bad economic conditions. These results are not conclusive, but it may

be possible that the environment of Pakistan is difficult to operate unlike developed countries. It may also be possible to investigate further with extra factors like reputation risk (Khan & Sukhotu, 2020), sustainability, managerial ownerships, and corporate risk (MacKay & Moeller, 2007).

References

- Acharya, V., Almeida, H., & Campello, M. (2007). Is cash negative debt? A hedging perspective on corporate financial policies. *Journal of Financial Intermediation*, 16(4), 515–554. <https://doi.org/10.1016/j.jfi.2007.04.001>
- Aggarwal, R., & Kyaw, N. A. (2010). Capital structure, dividend policy, and multinationality: Theory versus empirical evidence. *International Review of Financial Analysis*, 19(2), 140–150. <https://doi.org/10.1016/j.irfa.2010.01.001>
- Agliardi, E., Agliardi, R., & Spanjers, W. (2016). Corporate financing decisions under ambiguity: Pecking order and liquidity policy implications. *Journal of Business Research*, 69(12), 6012–6020.
- Agliardi, E., Agliardi, R., & Spanjers, W. (2016). Corporate financing decisions under ambiguity: Pecking order and liquidity policy implications. *Journal of Business Research*, 69. <https://10.1016/j.jbusres.2016.05.016>
- Ali, K., Khan, Z., Khan, N., Alsubaie, A.-H. I., Subhan, F., & Kanadil, M. (2016). Performance Evaluation of UK Acquiring Companies in the Pre and Post-Acquisitions Periods. *Asian Journal of Economics and Empirical Research*, 3(2), 130–138.
- Allen, F., & Michaely, R. (2003). Payout policy. *Handbook of the Economics of Finance*, 1, 337–429. [https://doi.org/10.1016/S1574-0102\(03\)01011-2](https://doi.org/10.1016/S1574-0102(03)01011-2)
- Almeida, H., & Campello, M. (2007). Financial Constraints, Asset Tangibility, and Corporate Investment. *The Review of Financial Studies*, 20(5), 1429–1460. doi:<https://10.1093/rfs/hhm019>
- Alnori, F., & Bakry, W. (2020). The Financial Determinants of Corporate Cash Holdings: Does Shariah-Compliance Matter? <http://dx.doi.org/10.2139/ssrn.3729096>
- Anton, S. (2016). The Impact of Leverage on Firm Growth. Empirical Evidence from Romanian Listed Firms. *Review of Economic and Business Studies*, 9. <https://10.1515/rebs-2016-0039>
- Babashova, S. I. (2020). Comparative analysis of testing heteroscedasticity in nonlinear regression. *Current and Historical Debates in Social Sciences: Field Studies and Analysis*, 211.
- Baker, H., & Weigand, R. (2015). Corporate dividend policy revisited. *Managerial Finance*, 41, 126–144. <https://10.1108/MF-03-2014-0077>
- Basheer, M. F., Khan, S., Hassan, S. G., & Shah, M. H. (2018). The Corporate Governance and Interdependence of Investment and Financing Decisions of Non-Financial Firms in Pakistan. *The Journal of Social Sciences Research*, 315(Special Issue), 316–323.

- Bennett, A., Kallus, N., & Schnabel, T. (2019). *Deep generalized method of moments for instrumental variable analysis*. Paper presented at the Advances in Neural Information Processing Systems.
- Berger, A. N., & Di Patti, E. B. (2006). Capital structure and firm performance: A new approach to testing agency theory and an application to the banking industry. *Journal of Banking & Finance*, 30(4), 1065–1102. <https://doi.org/10.1016/j.jbankfin.2005.05.015>
- Billett, M. T., King, T. H. D., & Mauer, D. C. (2007). Growth opportunities and the choice of leverage, debt maturity, and covenants. *The Journal of Finance*, 62(2), 697–730. <https://doi.org/10.1111/j.1540-6261.2007.01221.x>
- Bound, J., Jaeger, D. A., & Baker, R. M. (1995). Problems with instrumental variables estimation when the correlation between the instruments and the endogenous explanatory variable is weak. *Journal of the American Statistical Association*, 90(430), 443–450. <https://doi.org/10.1080/01621459.1995.10476536>
- Brav, A., Graham, J. R., Harvey, C. R., & Michaely, R. (2005). Payout policy in the 21st century. *Journal of Financial Economics*, 77(3), 483–527. <https://doi.org/10.1016/j.jfineco.2004.07.004>
- Budagaga, A. (2017). Dividend payment and its impact on the value of firms listed on Istanbul stock exchange: a residual income approach. *International Journal of Economics and Financial Issues*, 7(2), 370–376.
- Chance, D. M. (2019). An option pricing approach to corporate dividends and the capital investment financing decision. *Review of Financial Economics*, 37(4), 541–553. <https://doi.org/10.1002/rfe.1060>
- Chang, X., Dasgupta, S., Wong, G., & Yao, J. (2014). Cash-Flow Sensitivities and the Allocation of Internal Cash Flow. *Review of Financial Studies*, 27(12), 3628–3657.
- Che-Yahya, N., & Alyasa-Gan, S. S. (2020). Explaining Dividend Payout: Evidence from Malaysia's Blue-Chip Companies. *Journal of Asian Finance, Economics and Business*, 7(12), 783–793. <https://doi.org/10.13106/jafeb.2020.vol7.no12.783>
- Cook, D. O., & Tang, T. (2010). Macroeconomic conditions and capital structure adjustment speed. *Journal of Corporate Finance*, 16(1), 73–87. doi:<https://doi.org/10.1016/j.jcorpfin.2009.02.003>
- DeAngelo, H., DeAngelo, L., & Skinner, D. J. (2004). Are dividends disappearing? Dividend concentration and the consolidation of earnings. *Journal of Financial Economics*, 72(3), 425–456. [https://doi.org/10.1016/S0304-405X\(03\)00186-7](https://doi.org/10.1016/S0304-405X(03)00186-7)
- Dhrymes, P. J., & Kurz, M. (1967). Investment, Dividend, and External Finance Behavior of Firms *Determinants of Investment Behavior* (pp. 427–485): National Bureau of Economic Research, Inc.
- Eisner, R., & Strotz, R. (1963). *Determinants of business investment, Impacts of monetary policy, compiled by the Commission on Money and Credit*. Englewood Cliffs, NJ: Prentice Hall.
- Fama, E. (1974). The empirical relationships between the dividend and investment decisions of firms. *The American Economic Review*, 64(3), 304–318.
- Fama, E. F., & French, K. R. (2001). Disappearing dividends: changing firm characteristics or lower propensity to pay? *Journal of Financial Economics*, 60(1), 3–43. [https://doi.org/10.1016/S0304-405X\(01\)00038-1](https://doi.org/10.1016/S0304-405X(01)00038-1)
- Fama, E. F., & French, K. R. (2002). Testing trade-off and pecking order predictions about dividends and debt. *The Review of Financial Studies*, 15(1), 1–33. <https://doi.org/10.1093/rfs/15.1.1>
- Froot, K. A., Scharfstein, D. S., & Stein, J. C. (1993). Risk management: Coordinating corporate investment and financing policies. *The Journal of Finance*, 48(5), 1629–1658. <https://doi.org/10.1111/j.1540-6261.1993.tb05123.x>
- Gatchev, V. A., Pulvino, T., & Tarhan, V. (2010). The Interdependent and Intertemporal Nature of Financial Decisions: An Application to Cash Flow Sensitivities. *Journal of Finance*, 65(2), 725–763.
- Gong, G., Louis, H., & Sun, A. X. (2008). Earnings management and firm performance following open-market repurchases. *The Journal of Finance*, 63(2), 947–986. <https://doi.org/10.1111/j.1540-6261.2008.01336.x>
- Grabowski, H. G., & Mueller, D. C. (1972). Managerial and stockholder welfare models of firm expenditures. *The Review of Economics and Statistics*, 9–24. <https://doi.org/10.2307/1927491>
- Grullon, G., & Michaely, R. (2002). Dividends, share repurchases, and the substitution hypothesis. *The Journal of Finance*, 57(4), 1649–1684. <https://doi.org/10.1111/1540-6261.00474>
- Gugler, K. (2003). Corporate governance, dividend payout policy, and the interrelation between dividends, R&D, and capital investment. *Journal of Banking & Finance*, 27(7), 1297–1321. [https://doi.org/10.1016/S0378-4266\(02\)00258-3](https://doi.org/10.1016/S0378-4266(02)00258-3)
- Hansen, L. P. (1982). Large sample properties of generalized method of moments estimators. *Econometrica: Journal of the Econometric Society*, 1029–1054. <https://doi.org/10.2307/1912775>
- Harford, J., Klasa, S., & Maxwell, W. F. (2014). Refinancing risk and cash holdings. *The Journal of Finance*, 69(3), 975–1012. <https://doi.org/10.1111/jofi.12133>
- Harvey, C. R., Lins, K. V., & Roper, A. H. (2004). The effect of capital structure when expected agency costs are extreme. *Journal of Financial Economics*, 74(1), 3–30. <https://doi.org/10.1016/j.jfineco.2003.07.003>
- Hashem Pesaran, M., & Taylor, L. W. (1999). Diagnostics for IV regressions. *Oxford Bulletin of Economics and Statistics*, 61(2), 255–281. <https://doi.org/10.1111/1468-0084.00128>
- Hayashi, F. (2000). *Econometrics*. Princeton, NJ: Princeton University.
- Hidhiir, M. H., Basheer, M., & Hassan, S. (2019). The Simultaneity of Corporate Financial Decisions Under Different Levels of Managerial Ownership: A Case of Pakistani Listed Firms.

- Research in World Economy*, 10, 147. <https://doi.org/10.5430/rwe.v10n2p147>
- Higgins, R. C. (1972). The corporate dividend-saving decision. *Journal of Financial and Quantitative Analysis*, 7(2), 1527–1541. <https://doi.org/10.2307/2329932>
- Huang, R., & Ritter, J. R. (2009). Testing theories of capital structure and estimating the speed of adjustment. *Journal of Financial and Quantitative Analysis*, 44(2), 237–271.
- Hussain, R. Y., Wen, X., Butt, R. S., Hussain, H., Qalati, S. A., & Abbas, I. (2020). Are growth led financing decisions causing insolvency in listed firms of Pakistan? *Zagreb International Review of Economics and Business*, 23(2), 89–115. <https://doi.org/10.2478/zireb-2020-0015>
- Jagannathan, M., Stephens, C. P., & Weisbach, M. S. (2000). Financial flexibility and the choice between dividends and stock repurchases. *Journal of Financial Economics*, 57(3), 355–384. [https://doi.org/10.1016/S0304-405X\(00\)00061-1](https://doi.org/10.1016/S0304-405X(00)00061-1)
- Jansen, K. (2016). *External finance in Thailand's development: An interpretation of Thailand's growth boom*. Berlin, Germany: Springer.
- Jensen, G. R., Solberg, D. P., & Zorn, T. S. (1992). Simultaneous determination of insider ownership, debt, and dividend policies. *Journal of Financial and Quantitative Analysis*, 27(2), 247–263. <https://doi.org/10.2307/2331370>
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305–360. [https://doi.org/10.1016/0304-405X\(76\)90026-X](https://doi.org/10.1016/0304-405X(76)90026-X)
- John, K., & Nachman, D. C. (1985). Risky debt, investment incentives, and reputation in a sequential equilibrium. *The Journal of Finance*, 40(3), 863–878. <https://doi.org/10.1111/j.1540-6261.1985.tb05012.x>
- Khan, H., & Sukhotu, V. (2020). Influence of media exposure and Corporate Social Responsibility compliance on customer perception: The moderating role of Firm's reputation risk. *Corporate Social Responsibility and Environmental Management*, 27(5), 2107–2121. <https://doi.org/10.1002/csr.1951>
- Kirch, G., & Terra, P. R. (2019). Financial constraints and the interdependence of corporate financial decisions. *RAUSP Management Journal*, 55(3), 339–354. <https://doi.org/10.1108/rausp-01-2019-0003>
- Kuh, E. (1963). *Capital stock growth: A micro-econometric approach* (Vol. 32). Elsevier Science & Technology.
- Lambrecht, B. M., & Myers, S. C. (2012). A Lintner model of payout and managerial rents. *The Journal of Finance*, 67(5), 1761–1810. <https://doi.org/10.1111/j.1540-6261.2012.01772.x>
- Lee, C.-F., Liang, W.-I., Lin, F.-L., & Yang, Y. (2016). Applications of simultaneous equations in finance research: methods and empirical results. *Review of Quantitative Finance and Accounting*, 47(4), 943–971. <https://doi.org/10.1007/s11156-015-0526-0>
- Lintner, J. (1956). Distribution of incomes of corporations among dividends, retained earnings, and taxes. *The American Economic Review*, 46(2), 97–113.
- MacKay, P., & Moeller, S. B. (2007). The value of corporate risk management. *The Journal of Finance*, 62(3), 1379–1419. <https://doi.org/10.1111/j.1540-6261.2007.01239.x>
- MacKay, P., & Phillips, G. M. (2005). How does industry affect firm financial structure? *The Review of Financial Studies*, 18(4), 1433–1466. <https://doi.org/10.1093/rfs/hhi032>
- Martinez, L. B., Scherger, V., & Guercio, M. B. (2019). SMEs capital structure: trade-off or pecking order theory: a systematic review. *Journal of Small Business and Enterprise Development*, 26, 105–132. <https://doi.org/10.1108/JSBED-12-2017-0387>
- McCabe, G. (1979). The Empirical Relationship Between Investment and Financing: A New Look. *Journal of Financial and Quantitative Analysis*, 14, 119–135. <https://doi.org/10.2307/2330658>
- McDonald, J. G., Jacquillat, B., & Nussenbaum, M. (1975). Dividend, investment and financing decisions: empirical evidence on French firms. *Journal of Financial and Quantitative Analysis*, 10(5), 741–755.
- Morgan, I., & Saint-Pierre, J. (1978). Dividend and investment decisions of Canadian firms. *Canadian Journal of Economics*, 20–37. <https://doi.org/10.2307/134544>
- Mougoue, M. (2008). An empirical re-examination of the dividend–investment relation. *Quantitative Finance*, 8(5), 533–546. <https://doi.org/10.1080/14697680701458026>
- Mueller, G. G. (1967). International accounting. *The International Executive*, 9(4), 1–2. <https://doi.org/10.1002/tie.5060090401>
- Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, 5(2), 147–175. [https://doi.org/10.1016/0304-405X\(77\)90015-0](https://doi.org/10.1016/0304-405X(77)90015-0)
- Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, 13(2), 187–221.
- Nguyen, C. D. T., Dang, H. T. T., Phan, N. H., & Nguyen, T. T. T. (2020). Factors Affecting Financial Leverage: The Case of Vietnam Firms. *Journal of Asian Finance, Economics and Business*, 7(11), 801–808. <https://doi.org/10.13106/jafeb.2020.vol7.no11.801>
- Noe, T., Dasgupta, S., & Wang, Z. (2011). Where Did All the Dollars Go? The Effect of Cash Flows on Capital and Asset Structure. *Journal of Financial and Quantitative Analysis*, 46, 1259–1294. <https://doi.org/10.1017/S0022109011000512>
- Nwamaka, O. C., & Ezeabasili. (2017). Effect of Dividend Policies on Firm Value: Evidence from quoted firms in Nigeria. *International Journal of Management Excellence*, 8, 956–967.
- Omodero, C., & Ogbonnaya, A. (2018). Corporate Tax and Profitability of Deposit Money Banks in Nigeria. *Journal of Accounting, Business and Finance Research*, 3, 47–55. <https://doi.org/10.20448/2002.32.47.55>
- Pagan, A. R., & Hall, A. D. (1983). Diagnostic tests as residual analysis. *Econometric Reviews*, 2(2), 159–218. <https://doi.org/10.1080/07311768308800039>

- Panda, B., & Leepsa, N. (2017). Agency theory: Review of theory and evidence on problems and perspectives. *Indian Journal of Corporate Governance*, 10(1), 74–95. <https://doi.org/10.1177/0974686217701467>
- Peterson, P. P., & Benesh, G. A. (1983). A reexamination of the empirical relationship between investment and financing decisions. *Journal of Financial and Quantitative Analysis*, 18(4), 439–453.
- Phan, D. T., & Nguyen, H. T. (2020). Factors Affecting Corporate Investment Decision: Evidence from Vietnamese Economic Groups. *Journal of Asian Finance, Economics and Business*, 7(11), 177–184. <https://doi.org/10.13106/jafeb.2020.vol7.no11.177>
- Pivato, S., Misani, N., & Tencati, A. (2008). The impact of corporate social responsibility on consumer trust: the case of organic food. *Business Ethics: A European Review*, 17(1), 3–12. <https://doi.org/10.1111/j.1467-8608.2008.00515.x>
- Rizqia, D., Aisjah, S., & Sumiati, S. (2013). Effect of Managerial Ownership, Financial Leverage, Profitability, Firm Size, and Investment Opportunity on Dividend Policy and Firm Value. *Research Journal of Finance and Accounting*, 4.
- Roos, C. F. (1927). A dynamical theory of economics. *Journal of Political Economy*, 35(5), 632–656. <https://doi/abs/10.1086/253888?journalCode=jpe>
- Ross, S. A. (1977). The determination of financial structure: the incentive-signalling approach. *The Bell Journal of Economics*, 23–40. <https://doi.org/10.2307/3003485>
- Ruland, W., & Zhou, P. (2005). Debt, diversification, and valuation. *Review of Quantitative Finance and Accounting*, 25(3), 277–291.
- Sargan, J. D. (1959). The estimation of relationships with autocorrelated residuals by the use of instrumental variables. *Journal of the Royal Statistical Society. Series B (Methodological)*, 91–105. <https://doi.org/10.1111/j.2517-6161.1959.tb00317.x>
- Sheikhi, A., Bahador, F., & Arashi, M. (2020). On a generalization of the test of endogeneity in a two stage least squares estimation. *Journal of Applied Statistics*, 1–13. <https://doi.org/10.1080/02664763.2020.1837084>
- Siegrist, M., Bowman, G., Mervine, E., & Southam, C. (2020). Embedding environment and sustainability into corporate financial decision-making. *Accounting & Finance*, 60(1), 129–147. <https://doi.org/10.1111/acfi.12533>
- Smith, C. W., & Warner, J. B. (1979). On financial contracting: An analysis of bond covenants. *Journal of Financial Economics*, 7(2), 117–161.
- Srivastava, A. (2020). Overview of methods to address heteroscedasticity in factor analysis. *Economic and Social Development: Book of Proceedings*, 103–112.
- Staiger, D. O., & Stock, J. H. (1994). Instrumental variables regression with weak instruments: National Bureau of Economic Research, Cambridge, MA., USA.
- Stock, J. H., & Yogo, M. (2005). *Testing for weak instruments in linear IV regression. In identification and inference for econometric models: essays in honor of Thomas Rothenberg*, In: D. W. Andrews (Ed.), Stock JH, 80–108. Cambridge, UK: Cambridge University Press.
- Sudiyatno, B., Puspitasari, E., Suwanti, T., & Asyif, M. M. (2020). Determinants of Firm Value and Profitability: Evidence from Indonesia. *Journal of Asian Finance, Economics and Business*, 7(11), 769–778. <https://doi.org/10.13106/jafeb.2020.vol7.no11.769>
- Sulastri, S. A., & Isnurhadi, Y. (2020). Paradox Choice of External Financing Needs and Financing Decision: an Empirical Study of Manufacturing Companies in Indonesia. *Journal of Talent Development and Excellence*, 12(1), 140–147.
- Switzer, L. (1984). The determinants of industrial R&D: a funds flow simultaneous equation approach. *The Review of Economics and Statistics*, 163–168. <https://doi.org/10.2307/1924710>
- Theil, H. (1961). Economic forecast and policy. *Contributions to Economic Analysis, XV* Amsterdam, Netherlands: North-Holland Publishing Co.
- Tinbergen, J. (1938). Statistical evidence on the acceleration principle. *Economica*, 5(18), 164–176. <https://doi.org/10.2307/2549019>
- Tinbergen, J. (1940). On a method of statistical business-cycle research. A reply. *The Economic Journal*, 141–154. <https://doi.org/10.2307/2225763>
- Wang, C. -J. (2015). Instrumental variables approach to correct for endogeneity in finance *Handbook of Financial Econometrics and Statistics* (pp. 2577–2600). Berlin, Germany: Springer.
- Wang, D. H. -M. (2010). Corporate investment, financing, and dividend policies in the high-tech industry. *Journal of Business Research*, 63(5), 486–489.
- Yoon, P. S., & Starks, L. T. (1995). Signaling, investment opportunities, and dividend announcements. *The Review of Financial Studies*, 8(4), 995–1018. <https://doi.org/10.1093/rfs/8.4.995>
- Yuniningsih, Y., Hasna, N. A., Wajdi, M. B. N., & Widodo, S. (2018). Financial Performance Measurement Of With Signaling Theory Review On Automotive Companies Listed In Indonesia Stock Exchange. *International Journal of Entrepreneurship And Business Development*, 1(2), 167–177. <https://doi.org/10.29138/ijebd.v1i2.558>
- Yuniningsih, Y., Pertiwi, T., & Purwanto, E. (2019). Fundamental factor of financial management in determining company values. *Management Science Letters*, 9, 205–216. <https://doi.org/10.5267/j.msl.2018.12.002>
- Zaher, H., & Illescas, G. M. (2020). The moderating effect of firms' cash holding on the relation between cash conversion cycle and firm performance. *Economic and Social Development: Book of Proceedings*, 307–316.