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THE ROLE OF DIVIDENDS IN EQUITY MARKETS: EVIDENCE FROM SECTORAL-LEVEL ANALYSIS

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ABSTRACT

The purpose of this research is to identify how dividend payments affect the U.S. equity market at the sectoral level. A conventional stock valuation model predicts a positive response of equity price to higher dividend payment. Higher dividends convey confidence about the firm's future to the general investors, which is supported by the signaling hypothesis. Using representative exchange traded funds for 11 sectors in the U.S. along with traditional OLS and panel regression analysis, this paper shows that the stock valuation model is generally confirmed. Eight sectors show positive impacts of dividends with statistical significance found in three sectors; Consumer Staples, Utilities, and Real Estate.

JEL: G10, G12

KEYWORDS: Dividend Payment, Sectoral-level ETF, Equity Market Response

INTRODUCTION

According to the Stock Valuation Model, dividend payments affect the stock price in a positive way by giving a positive signal to the investors regarding future income (or cash flows). Due to informational asymmetry between the managers and the public, investors utilize any changes in dividend payments in their estimations of firms' future. Hence, any increase in dividend payments will convey more confidence about the firm's future among both managers and general investors.

There has been a great volume of empirical research on dividends and their impact on equity value. However, conflicting findings, due to firm-specific factors, create a lack of consensus on its effects. Some show positive responses that are consistent with the theory (Brzeszczynski and Gajdka, 2007; Lacina and Zhang, 2008) whereas others show no or negative responses to the dividend announcement or change (Jin, 2000; Vieira, 2011). In addition, some have found that firm size affects the equity market response to dividend payment changes (Ghosh and Woolridge, 1988; Eddy and Seifert, 1988; Haw and Kim, 1991; Mitra and Owers, 1995).

However, few studies have examined the issue at the sector level, even though varying results are expected across various industries due to informational asymmetry, differential characteristics, and market perceptions. Informational asymmetry differs across different-sized firms and industries. In addition, as shown by Baker and Wurgler (2006), investor sentiment has a substantial impact on stock prices, and its impact varies across sectors and different-sized firms. Stock returns are greatly differentiated depending on how high/low the initial investor sentiment was. Stocks that had below average sentiment earned higher returns during the subsequent period.

The purpose of this research is to identify the effects of dividends on the equity market at the sector level, as few authors have conducted similar research. To this end, this paper uses quarterly average Exchange Traded Funds (ETF) prices representing major sectors, which departs from many previous studies. We find

the stock valuation model is generally supported even at the sector level. This paper presents a literature review, data analysis and interpretation in Sections 2, 3 and 4. Concluding remarks are addressed in the last section.

LITERATURE REVIEW

Mozes and Repaccioli (1995) show that information conveyed by dividend announcements is more crucial in the stock price responses of smaller-sized firms. This is effectively shown in the *signaling hypothesis* which is examined by numerous researchers, such as Divecha and Morse (1983), Woolridge (1983), Miller and Rock (1985), Ofer and Thakor (1987), and Gwilym et al. (2000).

Using Polish stock market data, Brzeszczynski and Gajdka (2007) show that portfolios composed of high dividend yield growth beat the entire market in their dividend-driven investment strategy. Even though the findings are not consistent in their 10-year data analysis, they find that dividends play an important role in affecting stock prices by providing fundamental information about the investment. Gupta (2012) further shows that dividend policy can play a key role in affecting investment performance. Using the Dow Jones U.S. 2500 Universe decomposed into 19 categories, he compared the returns of dividend-paying stocks to non-paying stocks. The finding does not show a universally positive response. However, dividend-paying stocks outperform the non-paying firms, especially in the following sectors: industrials, consumer goods, telecommunications, utilities, and technology.

Lacina and Zhang (2008) also suggest that both stock price and trading volume are positively affected by dividend initiations. They studied if stock price and volume responses differ across high-tech and non-high-tech firms using data from 1997 to 2004. After controlling for firm size and dividend yield, both tech and non-tech firms show positive responses to dividend initiations, even though stronger responses are found in the tech-sector firms. Using post-Great Recession data of U.S. (2008-2015), Khanal and Mishra (2017) show more positive responses to dividend announcements. Their work shows how stock prices react to dividends by employing an event study method, in which 460 dividend announcement events were explored. Even though an abnormal response is not as strong as those of the pre-Great Recession period, the paper shows more prevalent positive responses.

Another positive relationship between stock prices and dividend payments is found in an earlier research by Docking and Koch (2005). They show that a negative response to lower dividends is greater during rising but volatile periods, whereas a positive response to higher dividends is more substantial during weak or normal periods.

By contrast, Jin (2000) indicates that 30 to 40 percent of firms had *negative* abnormal returns at dividend initiation announcements, which conflicts with the general theory. Jin (2000) shows the market reaction to dividend announcements differs from firm to firm, depending on the size of the benefits and costs. However, such negative responses are explained by the fact that more investors perceive dividend initiation as an event that lowers the firm's value. Vieira (2011) also shows that negative responses to dividend change announcements are commonly found, unlike the popular theory. Such negative responses are more profound in small-size firms that have higher growth opportunities with lower dividend variations, which confirms the signaling hypothesis in European stock markets.

Some papers that have worked on how investors' perception about the market may differentiate the effects of dividends on stock prices. Baker and Wurgler (2006) show the effects of dividends on stock returns depend on investors' sentiment. When sentiments are low, returns are greater for small growing firms that do not pay any dividends. However, the opposite is found when sentiments are high.

DATA AND METHODOLOGY

This paper uses quarterly data ranging between 1999 and 2017 in the U.S., obtained from Bloomberg and St. Louis Federal Reserve. The variables are dividend payment, sector equity price, total market index, interest rate, unemployment rate, and exchange rate (USD value). The variables are generally used in the equity market research.

The most representative ETFs for the sector equity price are used for 11 sectors in the U.S., as shown in Table 1. The table shows the sectors and corresponding ETFs of State Street SPDR and iShares. Table 2 shows the top 10 firms held by each ETF in the order of percent of the total assets. Furthermore, three-month average ETF prices are used to capture the three-month responses to dividends, which differ from those of previous research. Generally, dividends are paid quarterly, and their effect can last up to three months (or until the next dividend payment). The dividends' influence on the equity price is strongest when they are first declared, and gradually decline thereafter. However, it is worth taking into account the effects regarding the ex-dividend date as well. In addition, the actual payments that are also expected to affect stock price are made several weeks later. For these reasons, it is meaningful to identify three-month effects for longer-term responses, as most of the previous research focused on the short-term (or daily) responses to dividend declarations. All ETFs employed in this research pay dividends every three months (March, June, September, and December).

Table 3 shows the characteristics of each ETF for following categories: dividend yield as of 2017, average annual rate of return, annual dividend growth rate, and beta coefficient. For the total market index, we use an ETF that represents the S&P 500 index, SPY. The SPY is SPDR S&P 500 ETF, which is the biggest and most representative for the equity market. To determine the interest rate, we use the federal funds rate. However, the 10-year Treasury Note of U.S. is also used for checking the robustness of our results, and no qualitative difference is found. For the exchange rate, we use the value of US dollars (USD) against a basket of major foreign currencies. Hence, higher value means appreciation of USD.

Table 1: 11 Sectors and Corresponding Exchange-Traded Funds

Sectors	ETF
Consumer Discretionary	XLY
Consumer Staples	XLP
Energy	XLE
Finance	XLF
Health Care	XLV
Industrial	XLI
Materials	XLB
Technology	XLK
Utilities	XLU
(U.S.) Real Estate	IYR
Telecommunication	IYZ

Each ETF of 11 sectors in this paper is the most liquid and has the greatest net asset value among each sectoral ETFs. They are issued by State Street SPDR and iShares (IYR and IYZ), respectively.

Table 2: 10 Largest Holdings in Each ETF

	10 Largest Firms Held by the Fund
XLY	Amazon (AMZN), Home Depot (HD), Comcast (CMCSA), Walt Disney (DIS), McDonald's (MCD), Priceline (PCLN), Time Warner (TWX), Netflix (NFLX), Starbucks (SBUX), Nike (NKE)
XLP	Procter & Gamble (PG), Coca-Cola (KO), Phillip Morris (PM), Pepsi (PEP), Altria (MO), CVS (CVS), Wal-Mart (WMT), Costco Wholesale (COST), Colgate-Palmolive (CL), Mondelez International (MDLZ)
XLE	Exxon (XOM), Chevron (CVX), Schlumberger (SLB), Conoco Phillips (COP), EOG Resources (EOG), Occidental Petroleum (OXY), Halliburton (HAL), Phillips 66 (PSX), Kinder Morgan (KMI), Valero Energy (VLO)
XLF	Berkshire Hathaway (BRK.B), JPMorgan (JPM), Bank of America (BAC), Wells Fargo (WFC), Citigroup (C), US Bancorp (USB), Goldman Sachs (GS), Morgan Stanley (MS), Chubb (CB), American Express (AXP)
XLV	Johnson & Johnson (JNJ), Pfizer (PFE), United Health (UNH), Merck (MRK), AbbVie (ABBV), Amgen (AMGN), Gilead Sciences (GILD), Medtronic PLC (MDT), Bristol-Myers (BMY), Eli Lilly (LLY)
XLI	General Electric (GE), Boeing (BA), 3M (MMM), Honeywell (HON), Union Pacific (UNP), United Technologies (UTX), United Parcel Service (UPS), Lockheed Martin (LMT), Caterpillar (CAT), General Dynamics (GD)
XLB	DowDuPont (DWDP), Monsanto (MON), Praxair (PX), Ecolab (ECL), Air Products & Chemicals (APD), Sherwin-Williams (SHW), LyondellBasell (LYB), PPG Industries (PPG), International Paper (IP), Newmont Mining (NEM)
XLK	Apple (AAPL), Microsoft (MSFT), Facebook (FB), Alphabet A (GOOGL), Alphabet C (GOOG), AT&T (T), Visa (V), Intel (INTC), Cisco (CSCO), Verizon (VZ)
XLU	NextEra (NEE), Duke Energy (DUK), Dominion (D), Southern (SO), Exelon (EXC), PG&E (PCG), American Electric Power (AEP), Sempra Energy (SRE), Edison International (EIX), Consolidated Edison (ED)
IYR	American Tower (AMT), Simon Property (SPG), Crown Castle (CCI), Equinix (EQIX), Prologis (PLD), Public Storage (PSA), Welltower (HCN), Weyerhaeuser (WY), AvalonBay (AVB), Equity Residential (EQR)
IYZ	AT&T (T), Verizon (VZ), T-Mobile (TMUS), CenturyLink (CTL), Spring (S), Telephone and Data System (TDS), Shenandoah Telecommunications (SHEN), Vonage Holdings (VG), Consolidated Communications (CNSL), Iridium Communications (IRDM)

This table shows the top ten firms held by each ETF as of November 2017. They are listed in the order of percent out of total assets. The stock symbols are shown in parentheses.

Table 3: Statistic Summary of ETFs and Macro Variables

ETFs	**Dividend Yield (as of Nov. 2017, %)**	**Annual Rate of Return of ETF (Between 1999 and 2017, %)**	**Annual Growth Rate of Dividend (Between 1999 and 2017, %)**	**Beta Coefficient (of Last Three Years)**
SPY	1.86	5.77	6.87	1.00
XLY	1.46	7.89	13.18	0.93
XLP	2.74	6.41	9.80	0.48
XLE	3.14	7.82	9.09	0.99
XLF	1.47	5.04	2.68	0.93
XLV	1.47	8.70	19.07	0.85
XLI	1.85	7.94	8.66	0.88
XLB	1.78	7.99	6.48	1.28
XLK	1.36	3.89	15.85	1.10
XLU	3.09	7.79	4.42	0.09
IYR	4.03	9.70	5.07	0.56
IYZ	3.29	-1.39	0.81	0.74
Variables	**Lowest Value**	**Highest Value**	**Mean**	**Standard Deviation**
Federal Funds Rate (%)	0.07	6.53	1.93	2.09
Unemp. Rate (%)	3.90	9.90	6.04	1.76
Inflation (%)	-0.82	1.38	0.19	0.31
USD Value	95.28	128.94	111.36	9.75

To account for the dividend payments, the adjusted closing price is used for each annual rate of return. The numbers of Beta Coefficient are obtained using the standard deviation of each ETF, SPY and the correlation coefficient between the two, which is standard for the number. In general, the Beta Coefficients of the last three years are lower than those of entire period, which is reflecting that the market has been more stabilized during recent period. All macroeconomic variable data (monthly) are from St. Louis Fed web site. USD Value is a Trade Weight USD Index, and Jan. 1997 = 100. Inflation rate is derived from Consumer Price Index for All Urban Consumers.

To identify the robustness of the results, we regress the model first by including the economic recession as a dummy variable (Equation 1). Then, we re-estimate the model with the dummy variable excluded (Equation 2). There have been two recessions in the U.S. during the period according to the National Bureau of Economic Research: March 2001 – Nov. 2001 (8 months) and Dec. 2007 to June 2009 (1 and a half years).

Using OLS regression models, we estimate the impacts with and without a dummy variable of recession, (1) and (2), to better control for potential collinearity issue.

Two OLS regression models are as follows:

$$Price_{it} = \alpha + \beta_1 Dividend_{it} + \beta_2 SPY_t + \beta_3 IntRate_t + \beta_4 UnempRate_t + \beta_5 Inflation_t + \beta_6 USD_t + \beta_7 Recession_t + u_{it} \quad (1)$$

$$Price_{it} = \alpha + \beta_1 Dividend_{it} + \beta_2 SPY_t + \beta_3 IntRate_t + \beta_4 UnempRate_t + \beta_5 Inflation_t + \beta_6 USD_t + u_{it} \quad (2)$$

$Price_{it}$ is the price of the ETF of sector *i* at time *t*, $Dividend_{it}$ is the corresponding dividend of sector *i* at time *t*, and u_{it} is the idiosyncratic component, α is the intercept, $\beta_1 - \beta_7$ is a coefficient of each independent variable.

To study the overall impact of dividends on stock prices, panel regression models are also used. Panel regressions are similar to the OLS regressions in Equations 1 and 2, with the exceptions that all sectors are pooled together, as shown in Equation 3. $Price_{it}$ is the price of the ETF of sector *i* at time *t*, $Dividend_{it}$ is the corresponding dividend of sector *i* at time *t*, and u_{it} is the idiosyncratic component.

$$Price_{it} = \alpha + \beta Dividend_{it} + u_{it} \quad (3)$$

The variability across sectors can also be modelled with sector-specific intercepts by applying fixed effects. The sector-fixed effect controls for time-invariant observed and unobserved variables that might influence a sector's ETF price by adding dummies for each sector, $Sector_i$ (Equation 4). This allows us to control for some omitted variables that may be correlated to dividends and stock prices.

$$Price_{it} = \alpha + \beta Dividend_{it} + \gamma_1 Sector_1 + \cdots + \gamma_n Sector_n + u_{it} \quad (4)$$

Most variables that affect the financial markets tend to be time varying. Sector-fixed effects do not control for sector-specific time-varying variables, for instance demand for energy that might influence energy ETF. They also do not control for macroeconomic variables that vary over time, such as the business cycle. Time-fixed effects, on the other hand, control for time-varying variables that are common across all sectors. Dummy $Quarter_t$ is added for each quarter, as shown in Equation 5.

$$Price_{it} = \alpha + \beta Dividend_{it} + \delta_1 Quarter_1 + \cdots + \delta_T Quarter_T + u_{it} \quad (5)$$

The two-way-fixed effects, sector- and time-fixed effects, control for both sector-specific variables and common time-varying variables, as shown in Equation 6.

$$Price_{it} = \alpha + \beta Dividend_{it} + \gamma_1 Sector_1 + \cdots + \gamma_n Sector_n + \delta_1 Quarter_1 + \cdots + \delta_T Quarter_T + u_{it} \quad (6)$$

Random effects are estimated with partial pooling across cross-sectional groups, or in our case, sectors.

Random effects are useful when some sectors are underrepresented in the data. The sector random effects model in Equation 7 assumes that the sector-specific variable, γ_i, is uncorrelated with dividends. Therefore, if there are sector-specific variables correlated with dividends and ETF prices, they must be added to avoid omitted variable bias.

$$Price_{it} = \alpha + \beta Dividend_{it} + \gamma_i + u_{it} \quad (7)$$

Time-random effects assume that common time-varying variables captured in δ_t are uncorrelated with dividends, which is shown in Equation 8.

$$Price_{it} = \alpha + \beta Dividend_{it} + \delta_t + u_{it} \quad (8)$$

Both time- and sector-fixed effects are incorporated in a two-way random effect model as shown in Equation 9.

$$Price_{it} = \alpha + \beta Dividend_{it} + \gamma_i + \delta_t + u_{it} \quad (9)$$

Mixed effects models are also applied with a combination of sector and time, fixed, and random effects, as shown in Equations 10 and 11.

$$Price_{it} = \alpha + \beta Dividend_{it} + \gamma_1 Sector_1 + \cdots + \gamma_n Sector_n + \delta_t + u_{it} \quad (10)$$

$$Price_{it} = \alpha + \beta Dividend_{it} + \gamma_i + \delta_1 Quarter_1 + \cdots + \delta_t Quarter_t + u_{it} \quad (11)$$

A Hausman specification test (1978) is performed to test if the unmeasured sector-specific errors, γ_i, and period-specific errors, δ_t, are uncorrelated with the regressors. If γ_i and δ_t are uncorrelated with the regressors, random effects are consistent and efficient, and should be applied. If there is correlation, fixed effect should be applied. Under the null, random effect is the preferred model, while the alternative is that fixed effects is the preferred model.

RESULTS AND DISCUSSIONS

From the OLS regression of Model 1, we find more sectors whose dividend impacts are positive. Out of 11 sectors, eight sectors demonstrate positive impacts as shown in Table 4 (Consumer Discretionary, Consumer Staples, Finance, Health Care, Industrial, Materials, Utilities, and Real Estate). Only three sectors exhibit negative effects (Energy, Technology, and Telecommunication). Furthermore, those three negative impacts are all statistically insignificant. Thus, even though we have no homogeneous effects from dividends, the general impact of dividend on equity price is positive, which is in line with the stock valuation model.

However, only three out of eight sectors show that dividend is statistically significant in affecting the equity market: Consumer Staples (XLP), Utilities (XLU), and Real Estate (IYR). This is consistent with the general belief in the actual financial market, as dividends are a key factor and play a more important role in affecting the equity price in these three sectors. The investors take into account the dividend yield and stabilities for their investments in these sectors, as the sectors are relatively more stabilized compared to other sectors.

As Table 3 shows, the three sectors (XLP, XLU, and IYR) have the lowest beta coefficient numbers over the last three years (0.48, 0.09, 0.56, respectively). This implies that the three sectors have been less sensitive and volatile (or more stabilized) to market-wide shocks. In addition, the dividend yields of three sectors were 2.74, 3.09, and 4.03%, respectively, which were higher than the average market yield (1.86%). Furthermore, the average annual rates of return (including all the dividend payments) during the entire

period for the three sectors are 6.41, 7.79 and 9.70%, respectively. These are higher than the market average of 5.77% (partially due to higher dividend payments). Based on these characteristics (low beta, high dividend yield, and high rate of return), firms in these three sectors are advised to stabilize their dividend payment policy as much as possible as a way of boosting their share prices.

Table 4: Summary of Results of Equation 1 (3-Month Average Price with Dummy Variable)

	Intercept	Dividend	SPY	Int Rate	Unemp Rate	Inflation	USD	Recession
XLY	-10.64	7.38	0.38	-2.19	-0.76	-80.25	0.10	-3.32
(0.99/0.99)	(-1.35)	(1.10)	(24.27**)	(-7.54**)	(-1.89**)	(-0.78)	(2.40**)	(-3.50**)
XLP	-18.51	10.98	0.23	-0.71	0.69	-87.17	0.10	1.22
(0.98/0.98)	(-3.66**)	(2.15**)	(21.43**)	(-3.70)	(2.57**)	(-1.28)	(3.69**)	(2.03**)
XLE	130.56	-5.43	0.36	-0.88	0.62	-39.06	-1.15	5.06
(0.93/0.92)	(7.23**)	(-0.40)	(8.15**)	(-1.28)	(0.67)	(-0.16)	(-11.40**)	(2.31**)
XLF	14.81	0.15	0.05	-0.01	-1.29	85.35	-0.01	-1.30
(0.73/0.71)	(2.13**)	(0.26)	(5.54**)	(-0.06)	(-3.64**)	(0.93)	(-0.03)	(-1.58)
XLV	-12.94	10.40	0.33	-1.84	-0.78	-68.15	0.14	-0.24
(0.99/0.98)	(-1.74)	(1.24)	(23.67**)	(-6.29**)	(-2.16**)	(-0.72)	(3.27**)	(-0.28)
XLI	0.88	3.51	0.29	-0.44	0.07	31.07	-0.04	0.33
(0.99/0.99)	(0.17)	(0.68)	(28.57**)	(-2.24**)	(0.27)	(0.45)	(-1.38)	(0.51)
XLB	37.02	2.92	0.22	-0.96	-0.13	80.17	-0.30	1.14
(0.96/0.96)	(5.03**)	(0.95)	(23.30**)	(-3.50**)	(-0.34)	(0.82)	(-7.32**)	(1.31)
XLK	-60.64	-6.66	0.28	2.49	2.41	143.05	0.31	-0.87
(0.86/0.84)	(-4.25**)	(-0.64)	(13.42**)	(4.58**)	(3.33**)	(0.75)	(3.83**)	(-0.52)
XLU	0.42	26.55	0.21	-0.09	0.21	-24.02	-0.07	2.41
(0.97/0.97)	(0.07)	(3.48**)	(14.82**)	(-0.37)	(0.61)	(-0.29)	(-2.10**)	(3.10**)
IYR	57.47	11.12	0.32	-0.47	-0.74	-103.54	-0.48	-4.79
(0.93/0.92)	(3.09**)	(2.51**)	(16.70**)	(-0.73)	(-0.82)	(-0.48)	(-5.10**)	(-2.52**)
IYZ	-22.20	-5.12	0.15	2.17	1.49	45.71	0.11	0.44
(0.86/0.85)	(-2.99**)	(-1.31)	(15.66**)	(7.39**)	(3.89**)	(0.46)	(2.72**)	(0.50)

*The table shows the results of Equation 1. t-statistics are shown in parentheses, and ** indicates a significance at .05 level. Both R square and adjusted R square numbers are reported below each ETF symbol in the first column. Out of 11 sectors, eight sectors show positive responses to dividend changes. Furthermore, statistical significance is found in three sectors: consumer staples, utilities, and real estate.*

However, our findings further show that any dividend payment initiation and increase can be taken as a negative sign in the Energy (XLE), Technology (XLK), and Telecommunication (IYZ) sectors. This is consistent with the general beliefs in the market. Investors in the three sectors may thus assume that the firm(s) are nearing full maturity and further growth may be limited going forward. Hence, they may need to shift their investments out of the firms in the three sectors looking for more growth in other sectors. The Technology and Telecommunication sectors demonstrate 3.89% and -1.39% annual returns, respectively, during this period, which is lower than the average market rate (5.77%).

Due to the possibility of a collinearity issue between the dummy variable and SPY, we re-estimate the model, with the dummy variable for recession excluded (Model 2). As shown in Table 5, the results are very similar to those of Model 1 with no qualitative differences. Hence, our findings are robust to different model specifications.

Table 5: Summary of Results of Equation 2 (3-Month Average Price with No Dummy Variable)

	Intercept	Dividend	SPY	Int Rate	Unemp. Rate	Inflation	USD
XLY	-17.03	1.64	0.40	-2.11	-0.50	-93.96	0.13
(0.98/0.98)	(-2.06**)	(0.23)	(25.29**)	(-6.73**)	(-1.17**)	(-0.85)	(2.76**)
XLP	-16.46	12.05	0.23	-0.75	0.59	-82.49	0.10
(0.98/0.98)	(-3.25**)	(2.32**)	(21.10**)	(-3.84)	(2.21**)	(-1.19)	(3.38**)
XLE	139.13	1.55	0.33	-0.99	0.22	-34.47	-1.18
(0.92/0.91)	(7.64**)	(0.11)	(7.58**)	(-1.39)	(0.23)	(-0.14)	(-11.39**)
XLF	12.63	0.12	0.05	0.03	-1.21	83.83	0.01
(0.72/0.70)	(1.84**)	(0.21)	(6.15**)	(0.13)	(-3.41**)	(0.91)	(0.20)
XLV	-13.29	10.28	0.33	-1.83	-0.77	-68.72	0.14
(0.99/0.98)	(-1.82)	(1.23)	(24.44**)	(-6.33**)	(-2.15**)	(-0.73)	(3.34**)
XLI	1.29	4.23	0.29	-0.45	0.05	32.76	-0.04
(0.99/0.99)	(0.25)	(0.85)	(30.84**)	(-2.29**)	(0.20)	(0.48)	(-1.43)
XLB	38.88	3.21	0.22	-1.01	-0.20	82.80	-0.31
(0.96/0.96)	(5.36**)	(1.04)	(23.77**)	(-3.68**)	(-0.55)	(0.85)	(-7.51**)
XLK	-62.07	-6.82	0.28	2.53	2.46	141.23	0.31
(0.86/0.84)	(-4.45**)	(-0.65)	(14.05**)	(4.69**)	(3.46**)	(0.75)	(3.95**)
XLU	3.47	34.00	0.19	-0.17	-0.06	-6.55	-0.08
(0.97/0.96)	(0.53)	(4.42**)	(13.98**)	(-0.71)	(-0.17)	(-0.07)	(-2.26**)
IYR	45.79	12.97	0.34	-0.26	-0.28	-88.45	-0.44
(0.92/0.92)	(2.44**)	(2.85**)	(17.39**)	(-0.38)	(-0.30)	(-0.40)	(-4.53**)
IYZ	-21.49	-5.17	0.15	2.16	1.47	45.71	0.11
(0.86/0.85)	(-2.96**)	(-1.33)	(16.14**)	(7.41**)	(3.88**)	(0.46)	(2.70**)

*The table shows the results of Equation 2. t-statistics are shown in parentheses, and ** indicates a significance at .05 level. Both R square and adjusted R square numbers are reported below each ETF symbol in the first column. The results are similar to Table 4 (equation 1) with no qualitative difference found.*

Within our longer-term sector-level analysis that is different from previous research, we support the numerous findings of the positive role of dividends in the equity market. Thus, our findings generally support the stock valuation model, even in the long term. For the robustness of our findings, we perform panel data analysis as well.

Results from the panel regressions are robust in supporting a positive relationship between dividends and stock prices. Table 6 presents the key results from the panel regressions. Three-month average ETF prices are used for panel estimations. The first column indicates the panel regression specification, what kind of effects are applied - simple pooling, fixed effects, random effects, and mixed effects; for sector, time, and both. The second and third columns report the intercept and dividends' beta coefficients along with their corresponding t-statistics in parenthesis for panel regressions. *** indicates significance at 0.01 level, ** a significance at 0.05 level, and * a significance at 0.10 level. The fourth and fifth columns report the R-square and Adjusted R-square of the corresponding regression, respectively. As can be seen from Table 6 panel regressions with sector and time fixed effects have the highest R-squares, and a dividend coefficient of 4.155 is significant at the 5% level, with a t-statistics of 2.391. In all other specifications, the coefficient for dividends is positive and significant. Use of the three-month average prices stabilize ETF price volatility around announcements. The results reflect a longer-term impact of dividend on prices than just a momentary reaction to dividend declaration or announcement. Thus, in a longer-term analysis, the empirical results support the theoretical asset-pricing framework that stocks with higher dividends also have higher prices.

Table 6: Summary of Panel Regression Results (3-Month Average Price with No Control Variables) (Equations 3 – 11)

Panel Regression Specification	Intercept	Dividend	R-Squared	Adjusted R-Squared
Panel Regression with Simple Pooling	23.79 (31.03***)	31.79 (13.06***)	0.1733	0.1723
Panel Regression with Sector Fixed Effects	23.83 (32.40***)	31.62 (12.17***)	0.4061	0.3980
Panel Regression with Time Fixed Effects	27.21 (44.27***)	15.95 (7.771***)	0.5627	0.5183
Panel Regression with Sector and Time Fixed Effects	29.75 (64.20***)	4.155 (2.391**)	0.8236	0.8030
Panel Regression with Sector Random Effects	23.78 (8.294***)	31.63 (12.27***)	0.1566	0.1556
Panel Regression with Time Random Effects	26.26 (26.15***)	20.04 (9.998***)	0.1004	0.0993
Panel Regression with Sector and Time Random Effects	29.75 (9.027***)	6.813 (3.846***)	0.0189	0.0176
Panel Regression with Sector Fixed Effects and Time Random Effects	29.79 (64.27***)	6.648 (3.98***)	0.6097	0.6040
Panel Regression with Sector Random Effects and Time Fixed Effects	30.37 (65.08***)	4.047 (2.396***)	0.7591	0.7350

*Notes: This table presents the key results from the panel regressions. The first column indicates the panel regression specification, what kind of effects are applied - simple pooling, fixed effects, random effects, and mixed effects; for sector, time, and both. The second and third columns report the intercept and dividends' beta coefficients along with their corresponding t-statistics in parenthesis for panel regressions. *** indicates significance at .01 level, ** a significance at .05 level, and * a significance at .10 level. The fourth and fifth columns report the R-square and Adjusted R-square of the corresponding regression, respectively.*

The Hausman specification tests' Chi-Squared statistics are presented in Table 7, with p-values in parentheses. Under the null hypothesis, random effects is the preferred model, while the alternative is that fixed effects is the preferred model. The Hausman test for sector random effects yields a Chi-Square measure of 0.0009 and a p-value of 0.9755. The test fails to reject the null, that at the sector level, random effects is preferred. Thus, random effects are more consistent and efficient and that sector-specific unmeasured variables are uncorrelated with dividends. The test for time random effects, however, rejects the null hypothesis with a p-value of 0.0000. The test reveals that, at the univariate level, dividends are correlated with events across time, plausibly market events that affect dividends and stock prices, and time fixed effect is the preferred specification.

Based on the Hausman tests the preferred panel specification is sector random effects and time fixed effects. From Table 6 we can see the panel regression with sector random effects and time fixed effects yields a dividend coefficient of 4.047, which is positive and significant at the 1% level. The associated R-squares are also at the higher range compared to most other specifications, which is reinforcing earlier findings of this paper.

Table 7: Summary of Hausman Specification Tests

Panel Regression Specification	Chi-Sq. Statistic
Panel Regression with Sector Random Effects	0.0009 (0.9755)
Panel Regression with Time Random Effects	83.89 (0.0000)

This table shows the results of the Hausman specification tests for panel regressions with sector random effects and time random effects. The second column reports the Chi-Squared statistics, with p-values in parentheses. Under the null, random effects is the preferred model, while the alternative is that fixed effects is the preferred model.

CONCLUDING COMMENTS

Unlike previous research, this study identifies the sector-level equity market responses to dividend changes by employing traditional OLS and panel regression analysis tools with three-month (quarterly) average ETF prices of eleven sectors. Even though they are different across sectors, the effects of dividends on the *quarterly* equity market are generally positive. Eight out of eleven sectors show positive impacts of the dividend. In addition, three sectors (Consumer Staples, Utilities, and Real Estate) show that dividends are statistically significant in their effects on the *quarterly* equity price. Hence, the results of this sector-level analysis with quarterly data support the general stock valuation model in which the dividend affects the equity market positively. Panel regressions further reveal that dividends and ETF prices are positively related. The results are robust across different panel specifications, controlling for sector and time specific variables. However, this research does not perform the dividend impacts during two different market periods, bull and bear market, mainly due to the lack of ETF data. The effects are expected to differ across the two different periods. Hence, examining these periods will benefit future research. The findings will help identify the level of validity of the stock valuation model. Future research may also include firm level data to study the impact of dividends on stock prices for different company sizes.

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