

# The relevance of valuation models: insights from Palestine exchange

Insights from  
Palestine  
exchange

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## Abstract

**Purpose** – This paper aims to investigate the relevance of two groups of valuations models as follows: the accounting models based on the residual income (RIM) and the standard market model, on equity price, return and volatility relevance.

**Design/methodology/approach** – The models are tested on companies traded on Palestine exchange from 2009 to 2018, using panel regression analysis. Two-price and two-return models derived from RIM to compare with the market model and four volatility models.

**Findings** – The standard RIM outperformed other models in equity price modeling. The dividend discount model (DDM) outperformed the rest of the models in terms of return estimation. However, the authors find that the market model can explain equity variance better than RIM and DDM models.

**Practical implications** – For investors, market beta does not necessarily capture all relevant factors of value and traditional financial statements are still important in providing relevant information and different models are used for different values perspectives (price, return and volatility).

**Originality/value** – Previous studies focus on comparing the price and return relevance of accounting-based models (RIM and cash flow models). Three aspects differentiate this paper and contribute to its originality, namely, the uniqueness of the context, incorporating the market model into the picture along with the accounting-based models and adding Volatility dimensions of relevance.

**Keywords** Residual income model, Firm valuation, Abnormal return, Market model, Palestine exchange, Stock return volatility

**Paper type** Research paper

## 1. Introduction

Starting from the seminal work of [Ball and Brown \(1968\)](#), the association between the performance of financial markets and accounting information has attracted significant attention to various agents. Given the aim of the disclosed accounting figures is to provide

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investors with relevant information for valuation and investment decisions, which ultimately improves the informational efficiency of financial markets. In this sense, capital markets serve as platforms to diffuse relevant information to predict the firm's financial metrics, [Dumontier and Raffournier \(2002\)](#). Therefore, the fundamental theories of corporate finance had been developed based on relevant corporate financial information; such theories suggest that market prices move according to the financial and accounting information disclosed by the firm.

Depending on the availability of information and investor's preference, investors may choose the valuation model that is relevant, less time-consuming and fits their needs. Some investors rely on financial market models such as the capital asset pricing model (CAPM) or the arbitrage pricing model (APT) model. However, active investors are usually interested in reported financial statements and their analysis to assess the fundamental value or the exact worth of the firm. On the other side, residual income (RIM) is an example of how accounting information is relevant according to market investors.

In the literature, there exist two common practices related to valuation as follows: one is to compare the relevance of RIM with the cash flow models; the other is a value relevance practice using the RIM and accounting for the information dynamics. However, the comparison with market models is missing; therefore, this paper fills this gap and build on the previous works by comparing the relevance of two groups of models, the accounting-based models derived from the RIM and the standard market model, on price, return and volatility. These aspects are fundamental in contributing to the originality of this paper, which would be the first of its kind to test and compare the relevance of market-based and accounting-based models, at least in an emerging market context such as Palestine exchange (PEX). Motivated by the continuous changes in the regulatory environment in Palestine, including the company's law amendments, financial and securities law of 2004 and the developments in the accounting and disclosure practices, the study aims at investigating such a topic on the valuation of companies listed on PEX. In this context, developed markets have reached a mature level of research concerning testing the relevance of valuation models while emerging markets are still under investigation due to data availability and the degree of market efficiency.

The rationale behind this study is that different valuation models behave differently in certain contexts; in an emerging market such as PEX, how would accounting models and the market model perform in equity valuation and risk modeling? Given the theoretical equivalence between RIM and the cash flow models, here we introduce the standard market model, which belongs to a different set of models, thus this study examines whether it is possible to consider a certain model as superior from investors' perspective in explaining equity price, return and volatility. The standard market model assumes that the stock return is a function of the market return based on the beta coefficient, whereas the RIM is an accounting price model. As the market model is a return model and RIM is a price model, we transform RIM into two versions of return models based on RIM fundamentals to standardize the comparison, we also test two price models (the RIM and the dividend discount model (DDM)). Furthermore, we not only test the relevance of equity values but also the relevance of both return and volatility models. The study covers the period from 2009 to 2018 using panel regression analysis. Results show that the standard RIM outperformed other models in equity price modeling. DDM outperformed the rest of the models in terms of return estimation. However, we find that the market model can explain equity variance better than RIM models.

The rest of the paper is organized as follows: Section 2 covers the related literature, Section 3 describes the Palestinian context, Section 4 is dedicated for methodology, Section 5 presents the analysis and discussions and finally, in Section 6 conclusions are presented.

## 2. Related literature

Various corporate finance theories had been built and extended based on relevant corporate financial information, pecking order theories, arbitrage pricing theories, efficient market hypothesis theories, signaling models, capital asset pricing theories and theories on dividend policy (Frank and Goyal, 2003; Larcker and Lys, 1987; Malkiel and Fama, 1970; Myers and Majluf, 1984; Sharpe, 1964; Skinner, 2008). These theories suggest that equity prices move according to the financial and accounting information obtained from firms' reports.

### 2.1 *The relevance of accounting models and related hypotheses*

As reported by Hora *et al.* (1997), Kothari (2001); Dumontier and Raffournier (2002), the research concerning the relationship between accounting information and capital markets may fall within one of the following themes; testing of market efficiency for accounting information, fundamental analysis necessary for equity valuation and value relevance of financial reporting. Accordingly, this study falls within the last two themes, valuation and relevance.

The RIM framework, as firstly appeared in the work of Preinreich (1938) and later in Edwards and Bell (1961) and Peasnell (1981, 1982), states that asset prices represent the present value of future dividends and satisfying the clean surplus relation, the stock price is a linear function of only the book value and expected abnormal earnings. Ohlson (1995) re-elaborated the early RIM and developed a framework showing how the market value is a function of three accounting data, namely, earnings, book value and dividends in addition to his contribution to information dynamics as part of the Olson's model.

In accounting literature, RIM has become popular because of the formalization and development by Ohlson (1991, 1995) and Feltham and Ohlson (1995). Dechow *et al.* (1999) provide an empirical assessment of RIM, they point out that existing empirical research relying on Ohlson's model is similar to past research relying explicitly on the dividend-discounting model. They establish that the key original empirical implications of Ohlson's model stem from the information dynamics that link current information to future RIM, their empirical results generally support Ohlson's information dynamics in which incorporating information on analyst's forecast into information dynamics improves forecast accuracy. However, they show that the empirical implementation of Ohlson's model provides only slight improvements over existing attempts to implement the dividend-discounting model. Higgins (2011) also supported the information dynamics framework by demonstrating a method to forecast stock prices that use analyst earnings forecasts as essential signals of a company valuation. Amir and Lev (1996) examined the value relevance of financial and non-financial information of cellular companies and find that, on a stand-alone basis, financial information (earnings, book values and cash flows) are largely irrelevant for security valuation, while nonfinancial indicators are value relevant.

Penman (2001) demonstrated that the claim that cash flow and accrual accounting methods for valuing equities must always yield equivalent valuations is misguided. She concluded that practice inevitably involves forecasting over finite truncated horizons and the accounting specified in a model is pertinent to the valuation with finite-horizon forecasting. Plenborg (2002) compares discounted cash flow (DCF) and RIM, the two valuation approaches are compared based on analytical attractiveness. The study demonstrates that if practitioners introduce simplifying assumptions in their valuation of a company, they also introduce biases in their value estimates. Xiaoquan and Lee (2005) tested the empirical validity of RIM and compared the performance of this model with DDM. RIM is found not to be rejected by either test.

According to modern finance literature, stock price fluctuations are explained by changes in the expected present value of future dividends. This subject received remarkable attention using the volatility tests of [LeRoy and Porter \(1981\)](#) and [Shiller \(1981\)](#). They found, based on a simple DDM, that stock market volatility was far greater than could be justified by subsequent changes in dividends. Followed by [Flavin \(1983\)](#), [Kleidon \(1986\)](#) and [Marsh and Merton \(1986\)](#), who challenged the statistical validity of the volatility tests. Still, several studies provide evidence that stock price fluctuations are too large to result solely from changes in the expected present discounted value of dividends. It is evident from the previous research that RIM and cash flow models are competing in explaining equity prices and return, therefore, the following hypotheses are formulated:

- H1.* The RIM outperforms the DDM in stock value estimation.
- H2.* The accounting-based models outperform the market model in stock return estimation.

In emerging markets' context, [Almeida et al. \(2012\)](#) tested RIM and abnormal earnings growth (AEG) in Brazil and found that no significant differences between the two models. [Perek and Perek \(2012\)](#) investigated the relevance of RIM and DCF models in Turkey; they find that RIM results in lower company valuation compared. [Sarikhani and Ebrahimi \(2012\)](#) used RIM to predict stock prices in Iran and conclude that RIM can be used for predicting stock prices.

### *2.2 The relevance of the market model and related hypothesis*

On the other hand, financial markets' models such as the standard market model, which represents the basic formula for the characteristic line under the CAPM, assumes that all value-relevant information is discounted in the market coefficient beta. The CAPM is a model for pricing individual securities and portfolios, was introduced by [Treynor \(1961, 1962\)](#), [Sharpe \(1964\)](#), [Lintner \(1965\)](#) and [Mossin \(1966\)](#) independently, building on the earlier work of [Markowitz \(1952\)](#) on diversification and modern portfolio theory. The model considers the asset's sensitivity to the non-diversifiable risk represented by beta. Beta is estimated by the slope of the line connecting the different combinations of market returns (on the X-axis) and the security returns (on the Y-axis).

Regarding volatility, the relevance of accounting information has been a debate; [LeRoy and Porter \(1981\)](#) argue that volatility in the stock market is not explained by changes in dividends, this means that accounting and cash flow-based models sometimes fail to explain the market volatility, which leaves a space for the financial market models to do it. However, [Sridharan \(2015\)](#) tested empirically the volatility forecasting of accounting information and suggest that accounting-based volatility drivers may serve as useful indicators of the variance risk. Depending also on the context and the period, accounting and market models may contribute differently to explaining equity volatilities and the following hypothesis is formulated:

- H3.* The accounting-based models outperform the market model in terms of stock volatility modeling.

As evidenced in the literature, studies tend to compare different valuation models based on accounting information; however, the comparison between accounting-based models and financial market model is missing. Therefore, unlike the trend in the valuation research, in this study, we compare the relevance of both groups of models.

### 3. The Palestinian context and the institutional setup

*Context [1]:* Palestine represents a special context for study, under international law; it is recognized as occupied territory by Israel. It has been undergoing political and economic instabilities, as its occupation. However, the establishment of the Palestinian National Authority in 1994 has contributed to building national laws and institutions.

PEX was established in 1995 as a private company to promote investment in Palestine, then in 2010, it became a public shareholding company. PEX was fully automated, as its inception. The Palestinian Capital Market Authority (PCMA) supervises the operations of PEX.

Within the given conditions, PEX strives to ensure equity, transparency and competence in investment and trading, serving and maintaining the interest of investors. There are 48 listed companies as of March 31, 2019 with a market capitalization of \$3,758m that belong to five macro sectors; banking and financial services, insurance, investments, industry and services. The trades are in either Jordanian Dinar or US\$.

In terms of market efficiency, very limited research has been conducted on PEX, of which [Alkhatib and Harasheh \(2014\)](#) tested the weak form market efficiency and find that indices values do not resemble a random walk, similar results are found in other regional exchanges ([Jaradat and Hussien, 2011](#); [Smith, 2007](#); [Suleman et al., 2010](#); [Abraham et al., 2002](#); and [Elbarghouthi et al., 2012](#)).

*Regulatory framework [2]:* The principal pieces of legislation governing private companies are Jordanian Companies Law no. 12 (1964) in the West Bank and Egyptian Companies Act no. 18 (1929) in the Gaza strip. In 2005, the issuance of the Securities Law No. (12) of 2004 and the PCMA Law No. (13) of 2004 have improved the legal structure of securities investment in Palestine. The PCMA took over the responsibility of supervising PEX and issuing securities by the public shareholding companies.

*Accounting practices and disclosure [3]:* Such as international practices, in Palestine, all registered companies are required to file annual financial statements with the Companies Registrar within four months of the year-end. Additional rules apply to regulated entities (listed companies, banks and insurance companies). Banks must comply with IAS and the Palestine Monetary Authority regulations. Listed companies are required to follow IAS, as well as additional requirements of PEX and PCMA. Listed companies are required to submit audited financial statements on an annual, semi-annual and quarterly basis to PEX and PCMA.

In our opinion, these remarkable developments in the regulatory environment enhanced disclosure and trading practice, which leads to more transparency and a reduction in information asymmetries. These objectives would certainly be reflected in the models used by investors for investment decisions.

## 4. Models and data

### 4.1 Models

As discussed earlier, previous studies follow two lines of research, one is comparing the performance of RIM with the cash flow models (DCF or DDM) ([Dechow et al., 1999](#) and [Plenborg, 2002](#)) and the other is a value relevance of other information using accounting models ([Amir and Lev, 1996](#)); [Dhaliwal et al., 1999](#); [Biddle and Choi, 2006](#) and [Higgins, 2011](#)). In this study, we integrated both lines by introducing the Market Model into the analysis along with the accounting-based models, we also go farther by creating three groups of models to test the value relevance on price, return and volatility.

To perform this, three groups of models are used for testing the relevance. From RIM we derived *two price models*, one is the standard RIM based on abnormal returns and the other is a simplified version of DDM based on the clean surplus. From the standard RIM, we also

derived *two return models* to facilitate the comparability with the market model. Finally, from RIM and the market model we derived *four volatility models*.

*4.1.1 Basic notions of residual income.* RIM is defined as the net income less a charge for the opportunity cost. The model has gained global popularity as a valuation approach; it is also named as economic profit or abnormal earnings. Moreover, traditional financial statements are prepared to reflect earnings available to owners. Net income includes an expense to represent the cost of debt capital. Traditional accounting leaves to the owners the determination as to whether the resulting earnings are enough to meet the cost of equity capital. The economic concept of RIM, on the other hand, explicitly considers the cost of equity capital.

RIM represents the economic profit of the firm after deducting the cost capital. Assuming that over the long term the firm is expected to earn its cost of capital, any earnings above that cost can be termed abnormal earnings. According to RIM of valuation, the intrinsic value of the firm's equity has two components as follows:

- (1) The current book value of equity.
- (2) The present value of future RIM.

As presented in the initial work of Rubinstein (1976), following the developments of Peasnell (1982) and Ohlson (1995), the RIM model can be presented as follows:

$$MVE_{it} = \alpha + \beta_1 BVE_{it} + \beta_2 AR + \varepsilon_t$$

*MVE* is the market capitalization of equity, *BVE* is the book value of equity, *AR* is the abnormal return. The following equation is like the previous one, but it is normalized by the number of shares outstanding:

$$P_{it} = \alpha + \beta_1 BV_{it} + \beta_2 AR_{it} + \varepsilon_t$$

$P_{it}$  is the stock price,  $BV_{it}$  is the book value per share,  $AR_{it}$  is the abnormal return per share.

Abnormal return is calculated as follows:

$$AR_t = NI_t - Rf_t(BV_{t-1})$$

*NI* is the net income and *RF* [4], *BV* are the risk-free rate of interest and the book value for the preceding year.

*4.1.2 Price models derived from the residual income to test H1.* Starting from the original form of RIM:

$$P = BV + \sum_{t=1}^{t=n} \frac{AR_t}{(1 + Rf)^n}$$

Now we assume that income is perpetual, we get the following simplified RIM.

*Model 1:*

$$P = BV_t + \frac{AR_t}{Rf} \tag{1}$$

To derive the second price model, we break down *AR* to its components  $AR = NI_t - Rf(BV_{t-1})$ :

$$P = BV_t + \frac{NI_t - Rf(BV_{t-1})}{Rf}$$

$P = BV_t + \frac{NI_t}{Rf} - \frac{Rf(BV_{t-1})}{Rf}$ ,  $Rf$  in the last term on the right side is canceled.

$$P = (BV_t - BV_{t-1}) + \frac{NI_t}{Rf}$$

Model 2:

$$P = \Delta BV + \frac{NI_t}{Rf}$$

In a maturity regime with a clean surplus and all income is paid as dividends:

$$BV_t = BV_{t-1} + NI - DIV$$

$$\Delta BV = NI$$

Model 2 can be considered a special version of DDM, in which stock price equals the current income plus the present value of all future dividends (Miller and Modigliani, 1961).

4.1.3 Return models derived from the residual income to test H2. Starting from the standard RIM:

$$P = BV_t + \frac{AR_t}{Rf}$$

Now divide all parts by  $P_{t-1}$ , we get the following expression:

$$\frac{P_t}{P_{t-1}} = \frac{BV_t}{P_{t-1}} + \frac{AR_t}{Rf \times P_{t-1}}$$

Taking the natural logarithm of all terms, we get:

$$\log\left(\frac{P_t}{P_{t-1}}\right) = \log\left(\frac{BV_t}{P_{t-1}}\right) + \text{Log}\left(\frac{AR_t}{Rf \times P_{t-1}}\right)$$

Model 3:

$$R_{it} = \log\left(\frac{BV_t}{P_{t-1}}\right) + \log\left(\frac{AR_t}{Rf \times P_{t-1}}\right)$$

To derive the second return model, we start from the first return model (Model 3):

$$R_{it} = \log\left(\frac{BV_t}{P_{t-1}}\right) + \text{Log}\left(\frac{AR_t}{Rf \times P_{t-1}}\right)$$

Break down AR to its components  $AR = NI_t - Rf(BV_{t-1})$ , we get.

$R_{it} = \text{Log}\left(\frac{BV_t}{P_{t-1}}\right) + \text{Log}\left(\frac{NI_t}{Rf \times P_{t-1}}\right) + \text{Log}\left(\frac{Rf(BV_{t-1})}{Rf \times P_{t-1}}\right)$ ,  $Rf$  is canceled from the last term on the right, we get

$R_{it} = \text{Log}\left(\frac{BV_t}{P_{t-1}}\right) + \text{Log}\left(\frac{NI_t}{Rf \times P_{t-1}}\right) + \text{Log}\left(\frac{BV_{t-1}}{P_{t-1}}\right)$  Putting BV terms together and subtract, we get

$$R_{it} = \text{Log}\left(\frac{\Delta BV}{P_{t-1}}\right) + \text{Log}\left(\frac{NI_t}{Rf \times P_{t-1}}\right)$$

Again, this is a return model based on a special version of the dividend yield in which the stock return is a function of the current dividend yield plus the present value of all future dividend yields if the company distributes all its income as we previously assumed.

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4.1.4 *The standard market model.* The market model represents the original equation of the CAPM model that represents the characteristic line. It assumes that the market movements exclusively explain stock market return represented by the coefficient of the market return “beta” and it enables investors to value securities and portfolios as a function of the systematic risk. The equation below is for return estimation:

*Model 5:*

$$R_{it} = \alpha + \beta_1 RM_t + \varepsilon$$

Where  $\alpha$  is the intercept, which represents the return on non-market portfolio;  $B_1$  is the coefficient of market return (beta);  $R_{it}$  is the logarithm security return;  $RM_t$  is the logarithm of return on the market portfolio;  $\varepsilon$  is the error term.

4.1.5 *Volatility models to test H3.* To test this hypothesis, we calculated the two-period standard deviation, as a measure of volatility. The volatilities of stock price and stock return are used separately as dependent variables regressed against the market volatility in the market model and volatilities of the book value and abnormal return in RIM.

Table 1 summarizes the models. They are classified as price, return and volatility models, which at the end creates a matrix of models (price, return and volatility)  $\times$  (accounting-based and market-based). Based on the analytical attractiveness used by Bernard (1995), Amir and Lev (1996) and Plenborg (2002), it is worth noting that models in each class are comparable to each other (models with the same dependent variable, price, return or volatility) based on explanatory power  $R^2$  and the estimation error (root mean square error) and coefficients of each variable are not comparable, as they are different in each model. The aim of this paper is not to investigate, which component of different models is more significant, rather than comparing accounting-based and market-based models and whether to consider a certain model as superior from investors’ perspective in explaining equity price, return and volatility.

#### 4.2 Data

From 2009 to 2018, we collected data for 31 companies listed on PEX, which have available information for the period of the study. The rest of the companies (17 firms) have either been recently listed or they are illiquid. The variables were collected from Factset and manually verified from the company’s annual reports, the following variables represent the variables of interest, however, as shown in Table 2, other variables are calculated accordingly to fit the specifications of the models presented earlier:

- Stock price for the selected firms at the end of each financial year [5].
- Stock market index value at the end of each financial year.
- Book value per share for the selected firms at the end of each financial year.
- Net income for each year for the selected firms at the end of each financial year
- The average risk-free rate for each year (prime rate in Palestine).



Price models	Return models	Volatility models
$P = \alpha + \beta_1 BV_t + \beta_2 \left( \frac{AR_t}{Rf} \right)$	$R_{it} = \alpha + \beta_1 \left( \frac{BV_t}{P_{t-1}} \right) + \beta_2 \left( \frac{AR_t}{Rf \times P_{t-1}} \right)$	$SD_{Rit} = \alpha + \beta_1 SD_{MKT}$
$P = \alpha + \beta_1 \Delta BV + \beta_2 \left( \frac{NI_t}{Rf} \right)$	$R_{it} = \alpha + \beta_1 \left( \frac{\Delta BV_t}{P_{t-1}} \right) + \beta_2 \left( \frac{NI_t}{Rf \times P_{t-1}} \right)$	$SD_P = \alpha + \beta_1 SD_{MKT}$
	$R_{it} = \alpha + \beta_1 (RM)$	$SD_{Rit} = \alpha + \beta_1 SD_{BV} + \beta_2 SD_{AR}$ $SD_P = \alpha + \beta_1 SD_{BV} + \beta_2 SD_{AR}$

**Table 1.**  
The models

**Table 2.**  
Definitions of  
variables

Variable	Symbol	Description
Stock price	P	The closing share price at the end of each year
Stock return	Ri	The annual stock return calculated as the natural log of two consecutive prices
Market return	RM	The index return calculated as the natural log of two consecutive index values
Book value	BV	The book value per share
Book value to price	BV/P	The book value per share divided by the previous year's price
Earnings per share	EPS	The present value of the infinite series of EPS
Delta book value	$\Delta BV$	The change in BV, it reflects the current income or dividend
Delta book value per price	$\Delta BV/P$	The change in BV per share, it reflects the current dividend yield (DY).
Earnings per share per price	EPS/P	The present value of EPS, it reflects the future (DYs)
Abnormal return	AR	The present value of the infinite series of ARs
Standard deviation returns	$SD_{Ri}$	The standard deviation of stock returns
Standard deviation market	$SD_{MKT}$	The standard deviation of market return
Standard deviation BV	$SD_{BV}$	The standard deviation of BV
Standard deviation AR	$SD_{AR}$	The standard deviation of AR
Standard deviation price	$SD_P$	The standard deviation of stock price
Sector	$DUM_{SECTOR}$	Sector dummy
Year	$DUM_{YEAR}$	Year dummy

- The economic sector of the company (financial, industrial, service, investment) to capture specific effects.
- Year variable to capture the time effect.

As we have cross-sectional data combined with time series, a panel analysis is useful to consider year-firm dimensions. Each of the above models is tested with attention to statistical diagnostics for the use of the appropriate model. For each model, we provide the standard ordinary least square (OLS) regressions and the OLS with the sector-year dummies, robust regression is used when heteroskedasticity exists and Hausman test and Breusch–Pagan test for the use of fixed-effect or random-effect panel regression.

In this paragraph, we highlight some of the financial characteristics of the firms in the sample. Firms are heterogeneous in terms of revenues, market capitalization and assets. Revenues vary from \$400m to \$0.17m with an average of \$47m. In terms of market capitalization, disparities among firms also exist, the average market value is about \$96m and the maximum value is \$742m. The P/E multiple registered high values, which might indicate that the market is on average overvalued. It is also worth noting that channels to long term financing in Palestine are limited to equity capital, the corporate bond market does not exist and bank financing and the newly born leasing initiatives are the only means of long-term debt financing. Therefore, depending on equity financing would imply a higher cost of capital, which explains why many listed firms strive to survive, as it is challenging to find investments that return more than the cost of capital.

To give a glimpse of the relative performance of PEX to other regional markets, PEX can be compared to the nearest most similar market in terms of size, regulations and interconnectedness, Amman Stock Exchange (ASE). While in 2018, PEX registered a total market capitalization of \$3.73bn, ASE had \$22.7bn. PEX has only 48 listed companies

compared to 195 on ASE, this shows that PEX compared to its regional peers is still a limited size market due to the political and economic situation, which slows the free movement of capital and hinders the normal expansion of the financial market. In Table 3, Panel A; we compare PEX with ASE and in Panel B; we show the index performance during the year 2018.

#### 4.3 Descriptive statistics and correlations

Table 4 presents the descriptive statistics for the core variables. On average, the return of single stocks outperformed the market index (5% compared to less than 1%). Based on standard deviation, the present value of abnormal returns and Stock prices are very volatile compared to other variables; however, looking at the volatility for each unit of return (CV), index return turns to be highly volatile.

As preliminary empirical evidence of relationships indicated, the correlations among variables of interest are presented in the matrix in Table 5. As predicted by RIM, equity price is strongly and positively correlated with book value and abnormal return, price is also strongly associated with EPS, as in a steady-state regime of valuation; EPS can replace cash flow. As predicted by the standard market model, the equity return is strongly positively correlated with market returns, which also shows the relevance of the standard market model in return estimation. Stock return is strongly positively associated with BV/P, which provides an important insight for valuation; firms with higher BV/P enjoy higher returns,

	Panel A: comparison with ASE		Panel B: performance of regional exchanges			
	ASE	PSE	Gainers	% change	Losers	% change
Market Cap. (\$ billions)	22.7	3.73	Qatar	20	Palestine	-7.80
No. of listed firms	195	48	Tunis	17	Casablanca	-7.90
Average market cap. per firm	116	77	Abu Dhabi	13	Amman	-11
Institutional holding	72%	67%	Saudi	8	Iraq	-13
Foreign holding	53%	37%	Damascus	4	Egypt	-14
Index change from 2017	-11%	-7.80%	Bahrain	0.80	Muscat	-16
					Beirut	-16
					Kuwait	-18
					Dubai	-25

**Table 3.**  
PEX comparison  
with regional  
markets in 2018

Source: Palestine Stock Exchange (PEX) annual report 2018

Variable	OBS	Mean	SD	CV	MIN	MAX
Stock price	310	1.750	1.75	1.00	0.140	14.10
Stock return	279	0.050	0.26	5.11	-0.650	2.25
Market return	279	0.008	0.06	7.85	-0.082	0.13
Book value	310	1.890	1.35	0.71	-0.176	9.29
Book value_P	279	1.430	0.73	0.51	-0.279	5.26
Earning per share	310	0.168	0.32	1.89	-0.437	1.98
PV_Abnormal return	279	0.729	4.02	5.51	-8.110	22.25

Notes: OBS (number of observations), MEAN, SD (standard deviation), CV (coefficient of variation) and minimum-maximum values

**Table 4.**  
Descriptive statistics

	P	Ri	RM	BV	BV/P	EPS	AR
P	1						
Ri	0.173***	1					
RM	-0.004	0.173***	1				
BV	0.87***	0.11*	0.032	1			
BV/P	(0.337)***	0.28***	0.11*	-0.083	1		
EPS	0.866***	0.17***	0.086	0.82***	(0.15)**	1	
AR	0.781***	0.19***	0.094	0.69***	(0.14)**	0.97***	1

**Table 5.**  
Correlation matrix

**Notes:** P (equity price), Ri (equity return), RM (return on market index), BV (book value), BV/P (book value to price), EPS (PV of earnings per share), AR (PV of abnormal return) \*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

this is consistent with the theory of valuation using multiples, (Rosenberg *et al.*, 1985; Fama and French, 1992; Capaul *et al.*, 1993). EPS and abnormal returns seem to be strongly related to stock return, which is consistent with return determination models as in Bandyopadhyay (1994), Amir and Lev (1996), Dhaliwal *et al.* (1999) and Biddle and Choi (2006).

## 5. Analysis and results

### 5.1 Results of price models: residual income and dividend discount model.

Here we present the results of the regression analysis by comparing the two price models, the standard RIM and DDM.

The regression of the standard RIM presented in Table 6 shows how a model based on accounting figures strongly related to equity market valuation. It demonstrates the two principal components of equity market value; the book value and the present value of abnormal return explain 82% of equity price with 0.77 of estimation error. BV alone explains around 60% [6] of the market value and the rest is due to abnormal returns. Table 7 presents the findings of the simplified DDM price model.  $R^2$  is 78%, which is less than  $R^2$  reported in RIM and RMSE in DDM is 0.85. Therefore, based on explanatory power and the estimation error; RIM outperforms DDM in equity valuation, this means that BV and abnormal returns are more important for investors than dividends, which is plausible because dividends are discretionary while reporting abnormal returns creates value

Dep. variable: STOCK PRICE	OLS	OLS	ROBUST
BV	0.83 (17.1)***	0.77 (15.8)***	0.83 (11.4)***
AR	0.15 (9.4)***	0.17 (10.5)***	0.15 (7.4)***
DUM <sub>SECTOR</sub>	NO	YES	NO
DUM <sub>YEAR</sub>	NO	YES	NO
CONST	0.08 (0.87)	-0.16 (-1.02)	0.08 (0.68)
$R^2$	0.82	0.84	0.82
$P > F$	0.000	0.000	0.000
RMSE	0.77	0.74	0.77
N	279	279	279

**Table 6.**  
Price perspective:  
RIM model

**Notes:** RIM (price model), BV (book value), AR (PV of abnormal returns), DUM<sub>SECTOR</sub> and DUM<sub>YEAR</sub> are the dummy variables for sector and year. The model:  $P = \alpha + b_1BV + b_2AR + DUM_{SECTOR} + DUM_{YEAR} + \epsilon$  \*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ ; OLS is used based on the Breusch-Pagan test to choose between random effect and OLS

**Table 7.**  
Price perspective:  
DDM model

Dep. variable: <i>STOCK PRICE</i>	<i>OLS</i>	<i>OLS</i>	<i>FE</i>
$\Delta BV$	-0.77 (5.65)***	-0.64 (4.76)***	-0.66 (6.13)***
EPS	0.34 (30.8)***	0.33 (30.1)***	0.23 (13.19)***
$DUM_{SECTOR}$	NO	YES	NO
$DUM_{YEAR}$	NO	YES	NO
CONST	0.99 (17.22)***	0.37 (2.28)**	1.27 (22.01)***
$R^2$	0.78	0.81	0.000
$P > F$	0.000	0.000	
RMSE	0.85	0.80	
N	279	279	279

**Notes:** DDM (price model),  $\Delta BV$  (change in BV), EPS (PV of earnings per share),  $DUM_{SECTOR}$  and  $DUM_{YEAR}$  are the dummy variables for sector and year. FE is the panel with fixed effects. The model:  $P = \alpha + b_1\Delta BV + b_2EPS + DUM_{SECTOR} + DUM_{YEAR} + \varepsilon$  \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

(growth), as the return on capital exceeds the cost of capital. These findings are consistent with previous studies comparing RIM with DDM, for example, Bernard (1995) finds that RIM explains 68% of equity value while DDM explains only 28% and Dechow *et al.* (1999) show that RIM (Ohlson version) slightly outperform DDM. On the other side, Amir and Lev (1996) find that, on a standalone basis, earnings, book value and cash flows are irrelevant and Plenborg (2002) shows that RIM and DDM can perform differently (no strict superiority) depending on the simplifying assumptions behind. Similar findings are also found in other emerging markets such as Brazil, Iran and Turkey. In our context, the initial building block of equity value is the book value, then it is integrated by a second positive (negative) figure depends on the ability of the firm to generate returns more (less) than its cost of equity. The results additionally prove that accounting figures are relevant for investors and that equity values can discount financial information reported in financial statements.

### 5.2 Results of return models: market model, residual income and dividend discount model

In Table 8, the first OLS model presents the results of the market model before introducing sector-year dummies, its shows that market return strongly explains equity returns with a beta coefficient equal to 0.72 and statistically significant at 1% level. In the second OLS,

Dep. variable: $R_i$	<i>OLS</i>	<i>OLS</i>	<i>ROBUST</i>	<i>FE</i>
RM	0.72 (2.92)***	1.58 (1.88)**	0.72 (2.90)***	0.72 (2.94)***
$DUM_{SECTOR}$	NO	YES	NO	NO
$DUM_{YEAR}$	NO	YES	NO	NO
CONST	0.044 (2.91)***	0.17 (3.08)***	0.044 (3.04)***	0.044 (2.75)***
$R^2$	0.03	0.098	0.03	0.003
$P > F$	0.003	0.003	0.004	
RMSE	0.25	0.247	0.25	
N	279	279	279	279

**Notes:** Standard market model (return model),  $R_i$  (equity return), RM (return on market index),  $DUM_{SECTOR}$  and  $DUM_{YEAR}$  are the dummy variables for sector and year. The model:  $R_i = \alpha + b_1RM + DUM_{SECTOR} + DUM_{YEAR} + \varepsilon$  \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ ; It is used when the heteroskedasticity test rejects the null hypothesis that variances are homoscedastic FE is used based on the Hausman test for choosing between fixed effect and random effect

**Table 8.**  
Return perspective:  
standard market  
model

sector and year dummies are added, explanatory power improved and beta is still statistically significant, some significant differences among years and sectors also found. Robust and fixed effect (FE) regressions confirm the strong coefficient of the market return in explaining equity returns. Consistent with previous research CAPM in asset valuation, which confirms the importance of the market model for financial investors and in that sense, emerging markets behave similarly compared to developed markets.

To facilitate the comparability between RIM and the market model; we transform the standard RIM into two return versions (RIM and DDM). The two versions are presented below in Tables 9 and 10.

In the return-model (RIM version) in Table 9, equity return is explained by the two accounting ratios, BV/P and AR/P, both ratios are statistically significant, this means that firms with lower P/BV are undervalued and a certain premium is required by investors for investing in such firms, similarly, firms that generate higher abnormal return generate higher returns, as they can guarantee enough profits to compensate the cost of capital. These findings are consistent with the previous research (Rosenberg *et al.*, 1985; Fama and French, 1992; Capaul *et al.*, 1993; Bandyopadhyay, 1994; Amir and Lev, 1996; Dhaliwal *et al.*, 1999; Biddle and Choi, 2006 and Higgins, 2011). This model outperforms the standard market model in terms of  $R^2$  (3% vs 10%) and the RMSE (0.25 vs 0.24).

Dep. variable: $R_i$	OLS	OLS	RE-GLS
BV/P	0.094 (4.63)***	0.087 (4.2)***	0.12 (5.76)***
AR/P	0.012 (2.4)**	0.009 (1.86)*	0.011 (2.06)**
$DUM_{SECTOR}$	NO	YES	NO
$DUM_{YEAR}$	NO	YES	NO
CONST	-0.07 (-2.4)**	-0.002 (-0.03)	-0.12 (-3.4)**
$R^2$	0.10	0.17	0.000
$P > F$	0.000	0.000	
RMSE	0.24	0.238	
N	279	279	279

**Table 9.**  
Return perspective:  
RIM version

**Notes:** RIM (return version),  $R_i$  (equity return), BV/P (book value to price), AR/P (PV of abnormal returns to price),  $DUM_{SECTOR}$  and  $DUM_{YEAR}$  are the dummy variables for sector and year. The model:  $R_i = \alpha + b_1BV/P + b_2AR/P + DUM_{SECTOR} + DUM_{YEAR} + \varepsilon$ . \*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

Dep. variable: $R_i$	OLS	OLS	RE-GLS
$\Delta BV/P$	0.29 (5.91)***	0.27 (5.64)***	0.28 (5.9)***
EPS/P	0.008 (1.48)	0.005 (0.91)	0.008 (1.51)
$DUM_{SECTOR}$	NO	YES	NO
$DUM_{YEAR}$	NO	YES	NO
CONST	0.03 (1.65)*	0.10 (2.2)**	0.025 (1.63)
$R^2$	0.148	0.214	0.000
$P > F$	0.000	0.000	
RMSE	0.236	0.230	
N	279	279	279

**Table 10.**  
Return perspective:  
DDM version

**Notes:** DDM (return mode),  $R_i$  (equity return),  $\Delta BV/P$  (delta BV to price), EPS/P (PV of earnings per share to price),  $DUM_{SECTOR}$  and  $DUM_{YEAR}$  are the dummy variables for sector and year. The model:  $R_i = \alpha + b_1\Delta BV/P + b_2EPS/P + DUM_{SECTOR} + DUM_{YEAR} + \varepsilon$ . \*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

The DDM return model is shown in Table 10,  $\Delta BV/P$  is strongly related to equity returns in all models, this means that with clean surplus and all income is distributed as dividends,  $\Delta BV/P$  can be viewed as the current dividend yield, which contributes to higher stock return.  $R^2$  jumps from 14.8% to 21.4% when adding year-sector dummies. However, EPS/P demonstrates insignificance in this model, which can be due to the multicollinearity between the two independent variables. Similar results are reported in the previous work (Fama and French, 1992; Capaul *et al.*, 1993 and Amir and Lev, 1996). In sum, this return model shows stronger coefficients, more explanatory power and less prediction error compared to all other return models. The following table summarizes the statistics of all models to enhance comparability. For the price modeling, the RIM version outperformed the version of DDM. However, for return modeling, the DDM version outperformed both the RIM version and the market model (Table 11).

### 5.3 Volatility analysis

In managing investment portfolios, not only return maximization matters but also risk reduction is an important concern. In this section, we show, which model outperforms in explaining the volatilities of the stock price and return.

As shown in Table 12, we apply the market model and the accounting models to explain equity price and return volatilities. In Panel A, we use both models to estimate equity return volatility while in Panel B, the same models are used to model price

Model	Dependent variable	Independent variables	$R^2$ (%)	RMSE
RIM price model	Equity price	BV and AR	82	0.77
DDM price model	Equity price	$\Delta BV$ and EPS	78	0.85
RIM return model	Equity return	BV/P and AR/P	10	0.24
DDM return model	Equity return	$\Delta BV/P$ and EPS/P	14.8	0.23
Standard market model	Equity return	Market return	3	0.25

**Notes:** BV (book value per share), AR (PV of abnormal returns) BV/P (the book value to price) AR/P (PV of abnormal returns to price),  $\Delta BV$  (change in book value), EPS (PV of earning per share),  $\Delta BV/P$  (change in book value to price) and EPS/P (earning per share to price),  $R^2$  (explanatory power) and RMSE (root mean square error)

**Table 11.**  
Summary of price  
and return models

Panel A	Dep. variable: $SD_{R_i}$		Panel B	Dep. variable: $SD_P$	
	MM	RIM		MM	RIM
$SD_{MKT}$	0.42 (1.28)**		0.31 (0.8)*		
$SD_{BV}$		0.022 (0.58)		-0.15 (-0.99)	
$SD_{AR}$		-0.007 (-0.58)		0.013 (0.24)	
CONST	0.01 (0.59)	0.028 (1.56)	0.13 (1.52)	0.18 (2.38)*	
$R^2$	0.213	0.12	0.06	0.17	
$P > F$	0.07	0.7	0.8	0.6	
RMSE	0.09	0.03	0.13	0.12	
$N$	279	279	279	279	

**Notes:**  $SD_{R_i}$  (standard deviation of equity returns),  $SD_{MKT}$  (standard deviation of market return),  $SD_{BV}$  (standard deviation of BV),  $SD_{AR}$  (standard deviation of AR),  $SD_P$  (standard deviation of prices). MM (market model) \*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

**Table 12.**  
Volatility perspective

volatility. Interestingly, we find that the market model is more appropriate in single stock risk valuation compared to the accounting models. Furthermore, it appears that for each value perspective (price, return and volatility) there is a dominant model used by investors, for instance, investors tend to use the standard RIM for price valuation, DDM and DCF for return estimation, whereas, they use the market model for estimating equity volatility. This is consistent with [LeRoy and Porter \(1981\)](#), who questioned the ability of the accounting models to capture market volatility, but this might challenge the findings of [Sridharan \(2015\)](#), who argues that accounting-based volatility drivers may serve as useful indicators of the variance risk.

## 6. Conclusions

This study is considered novel and original in terms of methods, context and findings. We attempt to investigate the value relevance of various models on equity valuation for 31 firms listed on PEX. We empirically tested three relevance dimensions, namely, price, return and risk. Two main approaches are used, the standard market model, which is a financial market model and the accounting-based models (RIM and DDM). However, we derived two return models (RIM and DDM) to be compared with the market model (comparability of return relevance). Findings related to emerging markets have to be interpreted with caution given the weak level of market efficiency in such markets.

In terms of price relevance, we show that the standard RIM outperforms the DDM in terms of  $R^2$  and RMSE. This shows how investors value growth (making ROE higher than the cost of capital) more than receiving discretionary dividends. In this regard,  $H1$  is accepted.

In terms of return relevance, we provide that the standard market model explains modestly the stock return, while the beta coefficient is significant and consistent with other studies. However, the two derived return versions (RIM and DDM) outperform the market model and the DDM version can estimate better equity return as shown in [Table 11](#). Consequently,  $H2$  is also accepted in which the accounting-based models perform better than the market model in return estimation.

Regarding volatility modeling, we find that the market model is more appropriate in single stock risk valuation compared to the accounting models. It shows that investors discount accounting information for equity valuation (price and return) while they consider market volatility in valuing equity risk, which leads to the rejection of  $H3$  in which the market model performs better than the accounting model for volatility modeling. In conclusion, we show that RIM is more appropriate for price valuation, DDM is more suitable for return estimation and the market model fits better the volatility modeling.

These provide relevant implications for investors and policymakers. For investors, market beta does not necessarily capture all relevant factors for determining equity return and traditional financial statements are still valid in providing relevant information. To improve the decision-making and provide more transparency in the market place, policymakers should demand clear, timely and easily communicative financial disclosures because in our opinion improving the quality of accounting disclosure would improve the performance of the accounting models that would result in improving the market model as well.

This study is not free from limitations, as it is applied in a relatively small growing stock market. More research is needed in such markets, for example, including other countries in the MENA region or investigating the impact of certain financial regulations on the relevance of both models.



## Notes

1. The Palestine exchange [www.pex.ps/english](http://www.pex.ps/english)
2. The Palestine exchange [www.pex.ps/english](http://www.pex.ps/english) and the World Bank's report No. 56402.
3. The World Bank's report No. 56402.
4. The rate on bank loans for quality firms taken from the Palestine Monetary Authority, a simplifying assumption on which firms can borrow at  $R_f$ , so  $R_f$  is a proxy for the firms' cost of capital. Therefore, AR is the abnormal excess return over the risk-free rate.
5. The financial year ends on 31 December, it is a standard measure for all companies.
6. Unreported simple regression showing how each factor explains the market value.

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