The Economic Determinants of Systematic Risk in the Jordanian Capital Market

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Abstract

The Capital Assets Pricing Model is considered to be a centerpiece in modern finance due to its intensive use in both financial management and portfolio management. A large number of papers examined the determinants of systematic risk. The objective of this research is to answer the following questions: are emerging financial market and developed stock markets exposed to the same financial factors that affect systematic risk value? Amman Stock Exchange is taken in this study as a representative of emerging Arab financial markets. Moreover, do macroeconomic factors that affect International systematic risk value have the same effect on company's systematic risk value? Based on a panel approach it was found that several factors including size, financial leverage, government deficit and inflation rate significantly affect a company's systematic risk value.

Keywords: CAPM, Industrial Sector, Capital market, systematic risk

1. Introduction

It is well known that riskiness of an investments is related to uncertainty, which is associated with the expected outcomes from that investment. Furthermore, the total risk of investing in a stock is composed of two distinct risks. Capital asset pricing model (CAPM) explains one of them, particularly, the risk of being in the market. Malkiel and Xu (2006) identified this type of risk as the systematic risk. Such kind of risk is undevirsifiable. The other type – unsystematic risk - is specific to a company's fortune. Since uncertainty can be mitigated through appropriate diversification, Sharpe figured out that a portfolio's expected return hinges solely on its beta, that is, its relationship to the overall market. The CAPM helps measuring portfolio risk and the expected return associated with that risk. Return is the quantitative measure of investment performance. It represents the percentage increase in the investor's wealth resulting from making the investment. In the case of stocks, the return is the percentage change in price plus the dividend yield. (Tellis and Johnson, 2007). It is common to argue that the expectedreturn on an asset should be positively related to its risk. Individuals will hold a risky asset only if its expected return compensates for its risk.

The CAPM and the concept of beta as a measure of systematic risk have a number of practical uses in both portfolio management and corporate finance. These include the followings:

1- The construction of investment portfolios with the desired risk and return characteristics.
2- The evaluation of investment portfolios' performance.
3- The discounted cash flow valuation models.
4- The estimation of companies' cost of equity capital.

Given the above uses of the CAPM and beta, it is not surprising that a lot of researches have been published about the behavior and determinants of beta. These researches can be classified under two categories: First, a number of studies examine the past behavior of beta and try to predict its future value. Second, other studies relate beta coefficients of companies to a number of accounting and market – based variables which best explain its value.

2. Literature Review

The Jordanian industrial sector is primarily comprised of manufacturing and mining industries. Manufacturing companies industries on the whole, are mostly privately owned and are characterized by small size firm. Large-scale industries, originally initiated by the government, encompassed the prolonged regional political turmoil causing the inconsistent access to nearby markets, coupled with a limited domestic market in terms of size and purchasing power, have contributed to the absence of a sizable large scale manufacturing base in Jordan. Manufacturing industries consist mainly of light activities, the most salient of which include food processing consumer products, need –to- wear garments, and construction materials.In 2009, the manufacturing sector employed over 11% of Jordanian's labor force, and contributed around 15% to GDP.

The industrial production index indicates a substantial increase in industrial production in 2001 when compared to the previous years. The index grew by around 10% in 2009 compared to around 4% in the year 2008, and a mere 0.3% in 2007 (Central Bank of Jordan, 2009). The growth in industrial production is primarily attributed to the gleaming performance of industrial activities at the qualifying industrial zones.

The CAPM and the concept of beta as a measurement of systematic risk have a number of practical uses in portfolio management. "whether or not the CAPM is strictly true, it provides a rationale for a very simple passive portfolio strategy. Diversify your holding of risky assets according to the proportions of market portfolio and mix this portfolio with the risk free asset achieve a desired risk-reward combination" (Rodrigures, 2009). Moreover, given the fact that the CAPM is used in the determination of the discount rate in valuation models of the firm, it is not surprising that many research papers have examined the determinants of beta.

The objective of this research is to estimate the systematic risk for a number of industrial listed companies on Amman Stock Exchange (ASE) and to answer the following questions:

1- Are the financial factors that affect systematic risk value similar between developed stock markets and emerging markets as represented by Arab Stock Exchange (Amman Securities Market)?

2- Are the macroeconomic factors that affect International systematic risk value, affect companies systematic risk value?

The research about the systematic risk of listed companies can be classified under two categories. The first category estimates beta values for a number of past time periods and based on these estimates, they try to predict the future values of beta (technical analysis). Some of the main researchers who used this methodology include Amold (2005), Mandelbrot (2004), Malkiel (2003).

The second category tries to examine the impact of company fundamentals on the estimated beta values. It is well-known that the degree of financial leverage, operating leverage and company size are among the main variables which affect the beta values of companies. Indeed a number of researchers examined the impact of these variables and these include Damodaram (2009), Franzoni (2006).

There are some researchers who studied the impact of macroeconomic factors on international beta values, like, DilipPatro, John K. Wald and Yangru Wu (2000), they found that several variables including imports, exports, inflation, market capitalization, significantly affect Beta.

On the other hand, we found no studies on the impact of macroeconomic factors on company Beta Value, but as we referred previously some studies discussed the impact of macroeconomic factors on international beta value.
Relative to the Jordanian Stock Market, Omet and Al-Debi'e (2000) estimated the systematic risk for a total of 17 listed industrial companies and examined the relationship between these values and the debt to equity ratios of the companies. Based on the time period (1992-1996), they conclude that the debt to equity ratio is not a significant determinant factor of beta**.**

An individual who holds one security should use expected return, as the measure of the security is return. Standard deviation or variance is the proper measure of the security risk. Expected return, this is the return that an individual expects a stock to earn over the next period of course, because this is only an expectation, the actual return may be either higher or lower. An individual's expectation may simply be the average return per period a security has earned in the past, there are many ways to assess the volatility of a security return. One of the most common is variance, which is a measure of the squared deviation of a security's return from its expected return. Standard deviation is the square root of the variance.

Returns on individual securities are related to one another covariance that is statistic measuring the interrelationship between to securities.

Alternatively, this relationship can be restated in terms of correlation between the two securities. (1)

$$\text{Var (R)} = \text{Expected value of } (R-R)^2 \quad \text{_____ (1)}$$

Standard deviation is simply the square root of the var. the general formula for the standard deviation is:

$$SD(R) = \sqrt{\text{Var (R)}} \quad \text{_____ (2)}$$

If we consider a naive diversification strategy, in which you include additional securities in your portfolios, you might think of two broad sources of uncertainty, the risk that comes from conditions in the general economy, such as thebusiness cycle, the inflation rate factors can be predicted with certainty. In addition to these macroeconomic factors there are firm-specific influences, such as firms success in research and development, and personnel changes. These factors affect one firm with out noticeably affecting other firms in the economy.

When all risk is firm specific, diversification can reduce risk to arbitrarily low levels. The risk that remains even after extensive diversification is called (market risk), risk that is attributable to market wide), risk is also called (systematic risk), or (no diversifiable risk). In is called (unique risk), firm-specific risk, nonsystematic risk, or (diversifiable risk).
Market models use only a supposition of linear relationship between returns of securities and returns of the whole market. This can be represented by Eq.(3):

$Ri = \alpha i + biRm + \in i$ _____ (3)

Where:

R_i = the periodic returns on stock i.
α_i = the constant term.
B = the coefficient term (represents the sensitivity of stock i returns to market returns).
R_m = the periodic returns on the market portfolio.
$\in_i$ = the error term.

The CAPM is the most general form of one-factor equilibrium models. It demonstrates through the behavior of investors to which equilibrium price the capital market tends. As a basis of this process it indicates the marketportfolio as the only index, which demonstrates the whole market. This models beside the definition of relevant risk, defines the relationship between the expected return and risk.
In its most familiar form, the CAMP is represented by the following expression:

$$E(Ri) = Rf + Bi \left(E(Rm) - Rf \right) \quad (4)$$

Where:

E(Ri) = the expected return on stock (portfolio) i.
Rf = the risk free rate of return (treasury bills).
Bi = the systematic risk of security (beta).
E(Rm) = the expected return on the stock market index.

In other words, according to CAPM, and in equilibrium, the expected return on any stock (portfolio) is equal to be the risk tree rate of return plus its beta times the risk premium (Rm – Rf) on the market portfolio. The systematic risk (B) of any stock is estimated by regressing it returns on the corresponding returns of the market portfolio by Eq.(3).

Beta scaled so that the market as a whole has a beta of 1.0. A beta greater than 1 means the price of the investment is expected to move up more than the market when the market goes up and drop more when the market declines.
The simplifying assumptions that lead to the basic version of the CAPM were summarized in the following list:

1. There are many investors, each with an endowment (wealth) that is small compared to the total an endowment of all investors. Investors are price-takers, in that they act as though security price are unaffected by their own trades. This is the usual perfect competition assumption of microeconomics.
2. All investors plan for one identical holding period.
3. Investments are limited to a universe of publicly traded financial assets, such as stocks and bonds, and too risk-free borrowing or lending arrangements. It is assumed also that investors may borrow or lend any amount at affixed, risk – free rate.
4. Investors pay no taxes on returns and no transactions costs on trades in securities.
5. All investors are rational mean variance optimizers.
6. All investors analyze securities in the same way and share the same economic view of the world (homogeneous expectations)
   (Investments Bodie, Kane and Marcus, 1999, P251).
7. Risk aversion.

8. Returns of securities are normally distributed.
9. All securities are marketable.
10. Assets are infinitely divisible.
11. Investors are expected to market decisions solely in terms of expected values and standard deviations of the returns on their portfolios. "(Empirical tests of CAPM in the Hungarian capital market, Andor, sept. 5. 1999, P49).

Determinants of beta value were classified into two groups determinates of beta:

First: financial variables

1. Cyclicity of the revenues – more cyclical the revenues of a company is, the higher the beta of the company cyclical revenues tend to move with the business cycle in the economy.
2. Growth: the work over the past decade has shown corporate growth to be highly significant and consistent predictor of beta. The more pronounced the growth orientation, the higher the beta is likely to be. A growth-oriented strategy implies large capital investment plans. Such investment, especially if long-term, means greater investor uncertainty about the eventual outcome of this capital spending and this general translates into higher risk. Growth orientation can be measured directly by the growth rate of total assets. But another indication of future growth – one, which provides an even better gauge of, risk-is the extent to which the earnings from the company are retained, rather than begging paid out in dividends or transfers. Of high payout ratio implies little growth, while higher earning retention generally reflects a high level of expected capital investment.
3. Earnings variability:
   As demonstrated by both early and recent studies, earnings variation is a good and persistent indicator of business risk of the company and, hence, of likely future business risk and beta.
4. Financial leverage :

At last among industrial companies, for which conventional leverage ratios are meaningful, the greater the financial leverage, the beta. But, this result, although confirming our intuition, must be interpreted with caution.
The observed effects are not as large as financial theory would suggest. When highly levered companies are compared with less levered companies, the Difference in beta is less than would be expected if a given company levered I be self up and was subsequently compared to its previous position: this in turn suggests that difference in leverage reflect out only policy decisions about capital structure, but more importantly, external factors that affect a company's ability to support debt Those companies with low business risk and with tax exposures that make the benefits from interest deductions substantial are the ones most likely to have the heaviest debt loads. Consequently, when we compare highly levered with less levered companies, it is difficult to neutralize difference between business risk and income patterns. The effect of leverage alone on beta is obscured by the imperfectly neutralized effect of these two influences (Shefrin and Statman, 2000).

5. Operating leverage

The operating leverage is the percentage change in earnings before interest and tax for a given % change in sales. Operating leverage increases as fixed costs rise and variable costs fall. Companies with lower variable costs and higher fixed costs have higher operating leverage. Increases the riskiness of cash flows and leads to higher betas (Mandelbrot and Hudson, 2004).

6. Size

A final effect on beta, though less important than the others, is company size. As common sense suggests, the stocks of smaller companies are typically perceived by investors as riskier investments this effect, however, has been partly obscured by the fact that smaller companies trade in these markets, and this causes historical beta estimates to understate significantly the risks of these companies. But, when a correction is made for this "down ward bias "of small company betas, company size functions as another useful indicator of future risk.
Second : macroeconomic variables:

1. Inflation : according to the fisher theory, if stocks provide a hedge against inflation, the relation between stock returns and inflation should be positive. However, fame's proxy hypothesis (1981) asserts than increase inflation is expected to be followed by a decline in real economic activity and corporate profits, thus stock will react negatively to a rise inflation.
2. Taxes : if investors care about returns on an after-tax basis, then a higher tax rate may impact required before tax returns.

If investors demand a constant, or nearly constant, after-tax rate of return and return premium, then higher taxes may imply a higher discount rate or higher beta. (The impact of macroeconomic and financial variables on market risk, DilipK. Patro, 2000, P18).

3. Government surplus:

It a country government is running a surplus, the likelihood of an increase in taxes or borrowing by the government in the future will be lower than for a government running a deficit its higher tax rate lead to higher betas, a higher surplus may have the same impact on beta as lower taxes. (The impact of macroeconomic and financial variables on market risk, DilipK. Patro, 2000, P17)

There are lots of macroeconomics determinants as export import credit rating, market capitalization, growth rate of M1, which are considered the determinants of beta value and were empirically tested by DilipK.paro, John K. Wald, and YangraWa. In there research the impact of macroeconomic and financial variable on market risk . August 22, 2000.

Our research depends upon the using of two methodologies for calculating Beta value and examining its determinants.

First : The monthly closing prices of the 43 companies as well as the general market index are collected (1996-2000) to calculate returns as follows :

$$R_{it} = (P_{it} - P_{it-1}) / P_{it-1} \text{ …….. (5)}$$

Where : P_{it}, the price level of stock (i) in month (t).

Based on the calculated monthly returns, the beta coefficient for each company is then estimated by using the market model :

$$R_i = \alpha_i + \beta_i R_m + \in_i \text{…….. (6)}$$

Where :

R_i : monthly return for company (i)
α_i : the constant term
β_i : the beta coefficient.
R_m : the monthly returns on the general market index.
$\in_i$:the random error term.

The variables used in this methodology are defined as follows :

Beta *: systematic risk and is estimated according to equation (6)*
D/E : debt to equity ratio (book values)
TD : total debt.
LTD : Long term debt.
E : equity (book value)
TD/E : financial leverage (1)
LTD/E : financial leverage (2)
S *: company size measured by the size of total assets*
OL : operating leverage which equals fixed assets divided by total assets.
DIV : dividend yields which equals cash dividend divided by profit after tax.

In this methodology to examine the possible determinants of beta, we use the following cross section regressions:

$$\text{Beta} = \alpha + \beta_1 FL_{(1)} + \beta_2 \text{ OL} + \beta_3 \text{ S} + \beta_4 \text{ DIV} + \in$$
$$\text{Beta} = \alpha + \bar{\beta}_1 FL_{(2)} + \beta_2 \text{ OL} + \beta_3 \text{ S} + \beta_4 \text{ DIV} + \in$$

Where $FL_{(1)}$ is financial leverage (1), $FL_{(2)}$ is financial leverage (2), OL is operating leverage, S is company size, DIV is dividend yields and $\in$ is the error term which represents measurement errors in the independent variables and any other explanatory variables that have been omitted

Second :by using weekly closing prices of 28 companies as well as the general market index are collected (1996-2000) to calculate returns as in Eq. (5), then based on the calculated weekly returns, the yearly beta coefficient for each company is then estimated by using the following regression model :

$$Ri = \alpha_i + \Sigma^5_{n=1} \beta_{in} D_n . R_m + \in_i \text{…….. (7)}$$

Where,

Ri : *the weekly return for company (i)*

α_i : the constant term

β_{in} : the beta coefficient

R_m : the weekly return on the general market index.

D_n : the year dummy variables are defined as follows :

D_n = 1, if year (n) = 1, 2, 3, 4, 5
0, if otherwise

$\in_i$: The random error term.

The reason for choosing 28 companies in this methodology instead of using 43 companies as it was in the first methodology for examining Beta Value goes to our depending on weekly data which made us choose companies their shares are actively traded in the market.

In addition to financial variables used in the first methodology we used macroeconomics variables, which is defined as follows:

MC : Market capitalization which equals the log (numbers of outstanding shares multiplied by market price).

I : Inflation rate measured by change in cost of living index (%).

GD : Government deficit / surplus (Excluding Grants) to Gross domestic product.

In order to examine the possible determinants of beta, we pool data for 28 companies and run a panel regression :

$$Beta = \beta_0 + \beta_1 FL_{(1)} + \beta_2 OL + \beta_3 S + \beta_4 DIV + \beta_5 Mc + \beta_6 I + \beta_7 GD + \in$$

$$Beta = \beta_0 + \bar{\beta}_1 FL_{(2)} + \beta_2 OL + \beta_3 S + \beta_4 DIV + \beta_5 Mc + \beta_6 I + \beta_7 GD + \in$$

Where FL(1) is financial leverage (1), Fl (2) is financial leverage (2), OL is operating leverage, S is company size, DIV is dividend yields, Mc is Market capitalization, I is inflation rate, GD is government deficit, and $\in$ is the error term, which represents measurement errors in the independent variables and any other explanatory variables that have been omitted.

These macroeconomic variables were chosen for main reasons. First, the believe that these variables are among important economic variables impacting the stock equilibrium, and furthermore, they are somewhat "exogenous" in the scene that come from outside the stock market, second, guided by existing research. The reason why using the second methodology that this methodology depends on pooled time series and cross-section data, and these techniques are applicable in situations in which one has observations on N unites (companies) at T points in time (years).

A main strength of longitudinal design is that it allows controlling for heterogeneity bias due to the confounding effect of time – invariant omitted from the regression model, the effect of such omitted time-invariant variables will be similar to the effect of company specific intercept, that varies across companies, but remains constant for a given company over time. Another strength of this techniques is that it takes in consideration the autocorrelation in the dependant variable Beta, for these reasons we expect that second methodology will give us better estimations.

In applying pooled time series and cross – section data technique, we will use the following estimation methods :

* OLS : ordinary least squares.
* Fixed effects : the fixed effects estimator allows the constant (α) to differ across cross – section companies by estimating different constants for each cross-section.
* Random Effects : the random effects model assumes that the constant (α) is the sum of a common constant (α) and time invariant cross-section specific random variable (U) that is uncorrelated with the residual.
* GLS : (Cross section weights) : generalized least squares model making the estimations by taking in consideration giving weighs for each observation to avoid the effects of outlives.

The first methodology was applied using SPSS V.19 software, while the second methodology was applied using E views V.5 software.

3. Research Hypothesis

This research aims at examining the following hypotheses :

- There is a negative relationship between size and beta.
- There is a positive relationship between financial leverage and beta.
- There is a positive relationship between operating leverage and beta.
- There is a negative relationship between dividend yields and beta.
- There is a positive relationship between market capitalization and beta.
- There is a positive relationship betweeninflation rate and beta.
- There is a positive relationship betweengovernment deficit and beta.

4. Results and discussion

A look at table (2) one can realize that all variables reflect varying degrees of differences between the companies and interestingly, there are some companies which do not have any long term debt in their capital structures as seen in the minimum value of Financial leverage (2), industrial companies in Jordan have low operating leverage and high short term debt in their capital structures.

To examine the possible determinants of beta in first methodology, we use both correlation and regression analysis. The results of the correlation analysis are reported in table (3) below:
Table (3) reveals that company size is the only variable which is significantly correlated with beta.
When we estimate the following regression in first methodology:

$\text{Beta} = \alpha + \beta_1$ financial leverage(1) + $\beta_2$operating leverage + $\beta_3$size + $\beta_4$dividend Yield + $\in$

$\text{Beta} = \alpha + \bar{\beta}_1$ financial leverage (2) + β_2 operating leverage + β_3 size + $\beta_4$dividend yield + $\in$

We obtain the results reported in table (4) and (5).
Similar to the correlation results, these results indicate the absence of any linear relationship between the two measures of financial leverage and beta. Similarly, the results indicate that there is no relationship between operating leverage dividend yield and beta. However, while the coefficients of company size are statistically significant in both models, the signs are positive and this contrary to what one would expect. In other words, it seems that the larger the value of its systematic risk becomes. This observation might be due to several reasons. For example, it is well-known that financial economists have long recognized that nonsychronous prices (returns) can cause positive autocorrelation in portfolio returns. For example, LO and Mackinlay (1990) document that returns of small company stocks tend to large returns to portfolio of large company stocks. On the other hand, large returns on small company stocks are not correlated with contemporaneous returns on large company stocks. Moreover, McQueen et al (1996) show that cross autocorrelations exist even when the used returns in estimating beta are sampled at monthly returns. In other words, the beta estimates for small firms are severely based downwards.

4.1 Empirical results of Second Methodology

It can be noticed from the mentioned table No. (7):

- There are some companies that don't depend on long term depth in their capital structure, this is obvious from minimum value of financial leverage (2), whereas high short term depth in their capital structure. This reflects a disadvantage in the structure of external finance for the Jordanian Industrial companies which depend on that term depth resources for financing their fixed assets.
- The Jordanian Industrial companies have low operating leverage and this reflects the reduction in the operational performance due the labour circumstances in an inefficient market, in addition to the obtained capacity to the real capacity, due to the small size of the local market.
- Although the inflation rate average during the last two decade was 3.8%, but during the research period 1996 – 2000 the inflation rate average was 2.78%, this is due to the maximum value during the research period within 1996 reached 6.5% because the lifting of the government support to the price of grain.

The government deficit makes public expenditure increasingly difficult to control, even following the aggressive privatization scheme, which still left the number of employees on the government's playing roll unaltered.
The data mentioned above reflects and acceptable stability in the volume of market capitalization, and this is clear from the difference between maximum and minimum value and the difference between the mean and median.

The J.P test reflects the unsuitability of the data with normal distribution, although the non existence of normal distribution will not effect the results, but effects are on the confidence interval in the efficiency of prediction of the co-efficient.

Several characteristics of these results merit some comments :

First, all adjusted R^2 value are relatively low, however in panel data type approach its insignificant to obtain high values since the major focus in cross-section time series technique is the t-values and their statistical indications and the F-statistics are consistently significant at the 1% level.

Second, we can classify the coefficient estimate to:

1- Positive highly significant coefficient at the one percent level for size (β_3) and government deficit (β_7) under all kinds estimation (OLS, GLS, Random effect and fixed-effect).

If government is running a deficit, the likelihood of an increase in taxes or borrowing by the government, in future will be higher than for government running a surplus. If higher tax rates lead to higher betas (The impact of macroeconomic and financial variables on market risk, Dilip K., Patro, August 22, 2000), a higher government surplus may have the same impact on beta as lower taxes. Thus, a higher government deficit will lead to higher beta.

2- Negative and significant coefficient at 1% and 5% level for financial leverage(1) (β_1) under the GLS and the OLS estimations. In other hand coefficient for financial leverage (2) ($\bar{\beta}_1$) is negative and significant at 10% level under the GLS only.

The results of financial leverage as on of beta's determinants in Amman Stock Exchange exhibit the following:

a- The findings have come in conformity with other empirical studies, that were conducted on different markets, emphasizing the role of financial leverage as a major determinant of systematic risk. Those findings also move in line with the theoretical aspects of finance.

b- The results contradict with other Amman Stock Exchange previous studies that found no explanatory relationship between financial leverage and systematic risk. Moreover, a substantial diverse is witnessed with the results that were concluded using the first methodology.

c- The inverse relationship between the financial leverage and Beta is consistent with the distinguished features of Jordan Economy during the study period characterized with recession. In such conditions, companies tend to reduce its debt since highly leveraged firms will witness a higher rate decline in its beta's value comparing to lower – leveraged firm

d- Predicting financial leverage variable (β_1) is more precise than ($\bar{\beta}_1$) and this can be interpreted as a result of Jordan industrial companies being highly dependent on short term lending rather than long term one in determining its financial structure.

3- Positive and significant coefficient at 1% and 10% level for inflation (β_6) under the GLS and Random effect estimations.

According to the Fisher theory, if stocks provide a hedge against inflation, the relation between stock returns and inflation should be positive. However, Fama's Proxy Hypothesis (1981) asserts than an increase in inflation is expected to be followed by a decline in real economic activity and corporate profits, thus stocks will react negatively to a rise in inflation.

4- Coefficient for dividend yields (β_4) is a significant at 5% and 10% level under GLS and fixed-effect estimations, but the relationship is not clear.

The predictive power of dividend yield has been demonstrated for U.S. equity by Fama and French (1988) among others. More recently, Ferson and Harvey (1999) show that dividend yields are also useful in characterizing the cross of expected returns. Patro, Wald and Yangru (2000) expect that companies with high dividend payments maybe less risky. If a company has their value tied to higher future growth, rather than to current dividends, it may be more sensitive to market performance, if one compares a company with high dividends against a growth company with no or few dividends, the expectation is that the growth company may be more sensitive to future economic performance, so we suspect that a high dividend yield will be associated with lower beta.

5. Summary and conclusion

Based on the time period 2005–2009, first, we estimated the beta coefficients for total of 43 listed industrial companies by using eq. (6). Following, the estimated betas are then related to their respective financial variables (financial leverage measures, operating leverage, company size and dividend yield). In this methodology - based on both correlation analysis and cross section regressions analysis- it is found that company size is the only significant factor in determining the beta values. However, and contrary to international evidence and other Amman stock Exchange pervious studies, this relationship is found to be positive.

Second, we estimated beta coefficients for total of 28 listed industrial companies by using eq. (7). Following this, the estimated betas are then related to their respective financial variables (financial leverage measures, operating leverage, company size and dividend yield) and macroeconomics variables (inflation, market capitalization and government deficit). By employing this methodology -based on pooled time series and cross – section data analysis- it is found that not only size is the significant factor with beta's value, but there are many other factors which are highly significant in determining the beta's value. These factors can be classified as follows:

1- Financial Variables :
   - Size, and it has a positive relationship with the beta's value.
   - Financial leverage, and has in turn a negative relationship with the beta.
2- Macroeconomics variables and that includes Government deficit and inflation and both demonstrated a positive relationship with beta.

Based on the results of this research, we recommend the followings:

First, this kind of research should be applied to other stock markets in the Arab world.

Second, studying the impact of other macroeconomic on systematic risk estimate. These factors could be the growth of the monetary aggregate M1, the ratios of exports and imports to GDP and the ratio of tax revenues to GDP.

Third, further research should be conducted to analyze the impact of macroeconomic factors on beta value in the long run.

Fourth, studying the impact of other financial factors like earnings variability, accounting beta and liquidity of the shares (trading volume) on beta value.

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Table (1): Main indicators of the industrial sector

	2005	2006	2007	2008	2009
Values added at current price (JD Million)	723.7	791.5	893.8	924.1	964.7
Growth rate at constant price (%)	-6.3	10.5	7.5	5.5	4.5
Industrial exports (JD Million)*	879.7	885.8	881.3	924.0	963.4
Capital of registered industrial companies (JD Million)	28.5	50.1	24.0	28.0	25.3
Outstanding credit facilities extended by the industrial development bank (JD Million	91.3	95.1	92.5	94.2	88.4
Outstanding credit facilities extended by licensed banks (JD million)	610.6	590.5	701.8	766.2	784.1

* Represent gross domestic exports minus exports of food and live animals.

- Source: Central Bank of Jordan (2009), Annual Report.

Table (2) Beta and is explanatory variables

Variable	Mean value	Standard deviation	Minimum value	Minimum value
Beta	0.5407	0.59327	-0.624	1.773
Financial leverage (1)	0.9855	1.8858	0.03	11.34
Financial leverage (2)	0.3395	1.0352	0.00	6.32
Operating leverage	0.4360	0.3691	0.03	2.42
Size (log assets)	7.1076	0.6360	5.94	8.64
Dividend yield	0.3318	0.4853	-1.73	1.28

Table (3) Correlation analysis

	Pearson	Spearman
Variable	Beta	Beta
Financial Leverage (1)	+0.311	+0.111
Financial Leverage (2)	+0.381	+0.262
Operating Leverage	+0.026	+0.182
Size	+0.426*	+0.407*
Dividend yield	-0.119	-0.235

* Significant at the 5% level.

Table (4) Regression analysis

Variable	Coefficient	t - statistic	Colinearity statistic (VIF)
Constant	-1.979	-1.932	
Financial Leverage(1)	0.052	+1.048	1.224
Operating leverage	-0.152	-0.648	1.067
Size	+0.368	+2.470*	1.269
Dividend yield	-0.220	-1.251	1.035

R^2 = 0.238 ,Adjusted R^2 = 0.158
DW = 2.203
F-statistic = 2.965
* Significant at the 5% level.

Table (5) Regression Analysis

Variable	Coefficient	t -statistic	Linearity statistic (VIF)
Constant	-1.760	-1.777	
Financial Leverage (2)	+0.153	+1.767	1.203
Operating leverage	-0.192	-0.832	1.082
Size	+0.339	+2.382*	1.222
Dividend yield	-0.224	-1.302	1.035

R^2 = 0.275,Adjusted R^2 = 0.199
DW = 2.194
F-statistic = 3.610
* Significant at the 5% level.

Table (6) Variables : Some Descriptive Statisitcs

The descriptive statistics are based on the final sample of 140 cross sections 28 (1996-2000). Beta is systematic risk, $FL_{(1)}$ is financial leverage (1), $FL_{(2)}$ is financial leverage (2), S is company size, OL is operating leverage, DIV is dividend yield, I is inflation, GD is government deficit, MC is market capitalization to GDP.

	Beta	FL(1)	FL(2)	OL	S	DIV	I	GD	MC
Mean	0.483266	1.265719	0.488963	0.407696	7.231546	0.336736	2.780000	-8.160000	6.776580
Median	0.479645	0.513407	0.024828	0.396940	7.119420	0.413500	3.000000	-7.400000	6.586812
Maximum	3.150147	11.82966	6.725095	0.856810	8.665632	4.908836	6.500000	-5.800000	7.616790
Minimum	-1.009355	0.043239	0.000000	0.019147	6.216000	-11.48613	0.600000	-10.30000	6.515211
Std. Dev.	0.550666	2.294110	1.331985	0.209061	0.697482	1.159831	2.155642	1.699124	0.423098
Skewness	0.900300	3.334597	3.565106	0.166403	0.634013	-7.204588	0.649125	-0.043114	1.473811
Kurtosis	7.110676	13.97973	14.99304	1.988455	2.331469	80.09912	2.187586	1.504988	3.215119
Jarque-Bera	117.4823	962.6907	1135.592	6.614905	11.98647	35886.08	13.68190	13.08123	50.95272
Probability	0.000000	0.000000	0.000000	0.036609	0.002496	0.000000	0.001069	0.001444	0.000000
Observations	140	140	140	140	140	140	140	140	140
Cross sections	28	28	28	28	28	28	28	28	28

Table (7)

$$\textbf{Beta} = \beta_0 + \beta_1 FL_{(1)} + \beta_2 OL + \beta_3 S + \beta_4 DIV + \beta_5 MC + \beta_6 I + \beta_7 GD + \in$$

$$\textbf{Beta} = \beta_0 + \bar{\beta}_1 FL_{(2)} + \beta_2 OL + \beta_3 S + \beta_4 DIV + \beta_5 MC + \beta_6 I + \beta_7 GD + \in$$

Where : Beta is systematic risk, $FL_{(1)}$ is financial leverage (1), $FL_{(2)}$ is financial leverage (2), OL is operating leverage, S is company size, DIV is dividend yields, MC is market capitalization, I is inflation rate, GD is government deficit, and $\in$ is the error term which represents measurement errors in the independent variables and any other explanatory variables that have been omitted. Numbers in parentheses appearing below the coefficient are White (1980) heteroskedasticity – constant t – statistic. The numbers in brackets are t - values.

	OLS	GLS (cross section weights)	Random effect	Fixed – effect
β_0	-2.1554 (-1.8774)***	-1.5646 (-3.0945)*	-2.0839 (-1.8956)***	
β_1	-0.0312 (-1.9368)**	-0.0257 (-2.5614)*	-0.02681 (-0.9642)	0.0952 (1.5107)
$\bar{\beta}_1$	-0.0285 (-1.0202)	-0.0261 (-1.6992)***	-0.0127 (-0.2568)	0.2156 (1.8834)***
β_2	0.3282 (1.2494)	0.2521 (2.3400)**	0.2875 (1.0337)	-0.5525 (-0.7451)
β_3	0.3221 (4.7676)*	0.2615 (7.2613)*	0.3084 (3.3832)*	-1.3726 (-2.1085)**
β_4	-0.0083 (-0.2794)	0.0162 (2.2136)**	0.0065 (0.1802)	0.0246 (1.6827)***
β_5	0.1038 (0.8857)	0.0955 (1.8725)***	0.1096 (0.9720)	0.1188 (1.3167)
β_6	0.03893 (1.4473)	0.0387 (3.3880)*	0.0386 (1.7178)***	0.0321 (1.5728)
β_7	0.0727 (2.7205)*	0.0835 (6.6249)*	0.0734 (3.0064)*	0.0721 (3.2468)*
Adjusted R^2	0.2142	0.5972	0.3502	0.3464
F-Statistic	6.4133*	30.4519*		17.947*

* Significant at the 1% level.

** Significant at the 5% level.

*** Significant at the 10% level.