INVESTIGATING RELATIONSHIP BETWEEN CONSUMER PRICE INDEX AND PRODUCER PRICE INDEX AND DIVIDEND PER SHARE
(CASE STUDY: Accepted Firms in Tehran Stock Exchange in 2001-2009)

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ABSTRACT

Managers of economic institutions should possess some criteria in the stock exchange so that they can evaluate their performance and economic plans. Criteria for performance evaluation accounting can be used for evaluating performance and economic plans. One of the main criteria for performance evaluation accounting is reported accounting profit or dividends. This criterion is one of the main indexes for evaluating managers' performance, and it is also a main criterion for decision-making on approval or rejection of economic plans. This index is influenced by different factors such as price index, especially consumer price index and producer price index. In this paper, relationship between producer price index and consumer price index is investigated in accepted firms in Tehran stock exchange. Dicky- Fuller Test is used for time series reliability and Pearson correlation coefficient and Granger-causality tests are used for investigating the relationship between variables. Finally, it was concluded that consumer price index has an inverse correlation with dividend per share (first hypothesis), and producer price index has a direct correlation with dividend per share (second hypothesis).

1. INTRODUCTION

Establishment of a stock exchange in every country indicates beginning of a stage of economy evolution and growth stages, thus. Stock exchange would not be established as long as there is no need for capital accumulation necessity and its accumulation for the financial provision of national economic development projects, or if it's established it wouldn't play any substantial role in an economy. Currently, stock exchange is considered as one component in national economy components in most developed and developing countries and financial funds of the society are collected by it and it is used for realization of economic development goals.

Most economists acknowledge that managers of economic institutions in the stock exchange should possess some criteria based on which they can evaluate and measure their performance. In addition, they also need some criterion for evaluation of different economic plans. Determining and introducing criteria for performance evaluation of individuals or organizational units in the area of every economic institution with various and heterogeneous units and activities is as a function of two factors: main and central strategy of economic institution, and activities that individuals and units perform to achieve realization of main and central strategy of the economic institution.

In order to evaluate performance and economic plans two kinds of criteria can be used. One is criteria for performance evaluation accounting (including asset return rate, equity shareholder's return, dividend per share, stock return) and the other is economic criteria of performance evaluation (including economic value added. Market value added, adjusted economic value added). One of the main criteria for evaluating performance is reported accounting profit or earning per share, which is based on accounting models. In fact, this criterion is one of the main indexes for evaluating managers' performance, and it is also a main criterion for decision-making on approval or rejection of economic plans. It determines profit gained by the firm during a certain period per one ordinary share (indicating a percentage of annual profit, which is distributed among ordinary stakeholders in cash). In order to evaluate performance of the organization and/or the manager, dividend per share of the organization is calculated and performance of the organization and/or the manager is evaluated by comparing to previous periods. One factor which influences on profitability (dividend per share) is consumer price index (CPI) and producer price index (PPI). CPI is one of the main price indexes for measuring inflation rate and domestic purchasing power of the countries. This index measures changes in price of goods, and services purchased by households or customers. It can be used for designing welfare and social security plans, wage adjustment and mutual contract setting.

Producer price index specifies a change in prices which producer takes for its products every month. It is in close relationship with market and is considered as an index in current inflation level. As other price indexes, producer price index value can be an indicator of an increase in an interest rate which is considered for fighting against inflation. These indexes are often traced carefully since investors seek for inflation pressure indicators, which can change the interest rate [1]. In this paper, relationship between producer price index and consumer price index is investigated in accepted firms in Tehran stock exchange in 2001-2009.

2. PREVIOUS RESEARCH

Diaz investigated the relationship between inflation (CPI) and stock return and dividend per share in Spain in 2009. He found that the influence of inflation on stock return and dividend per share depends on potential intervening factors such as risk-free interest rate, future growth expectations and risk premium. He also found that there is the significant positive relationship between inflation and stock return and dividend per share in the occurrence of bad news (real inflation rate lower than the expected inflation rate) [2].

Sharma (2011) studied effect of tendencies of board of directors and economy general status on earning per share payment using data of 944 public firms in 2006. He observed that tendency of board of directors to increase and/or fixing earning per share payment decreased by the increase in the consumer price index (inflation). Therefore, earning payment decreases. That is, there is the inverse relationship between CPI (inflation) and dividend per share payment [3].

Walter Lane (2006) compared inflation in Europe and America regarding consumer price index. He introduced an experimental consumer price index for USA so that is matched to CPI of Europe union. American CPI is different from European CPI in two respects: rural population and landlord people. His paper indicated that CPI has less inflation effect in USA than Europe, and also it has less effect on profitability of firms in USA compare to Europe [4].

Williams (2008) proposed a model for investigating the effect of access to internet services on a consumer price index. This model studied directly effect of internet service rice on CPI and subsequently, inflation. Finally, they concluded that access to internet services has the positive effect on CPI [5].

One of the factors deriving from CPI and PPI is inflation. In many studies, the effect of inflation (with basis of CPI and PPI) on financial performance indexes such as stock return and dividend per share have been examined. For example, findings of experimental study by Graham (1996) indicated that relationship between stock return and inflation is instable; that is, it is a positive relationship in some periods, and it is

negative in other ones. Results for study by Jung (1997) demonstrated that predicted inflation have negative effect on share's prices, which leads to a reduction in dividend per share [6]

3. THEORETICAL PRINCIPLES
3.1. Dependent Variable
3.1.1. Dividend per Share
Dividend per share indicates a percentage of annual profit, which is divided among ordinary shareholders in cash. This ratio is important both for shareholders and creditors. Shareholders insist that this ratio is determined high so that their cash share of profit is increased, while creditors tend this ratio to be determined low so that firm has enough liquidity, and it doesn't face any problem in its repayment of debt principal and interest. This ratio also indicates firm's profit division policy. If this ratio is subtracted from 1, accumulated profit percentage in the firm is given [9]:
DPS = firm's dividend per share/ordinary shares number
Therefore, Dividend Pay- out Ratio (DPR) is defined as follows:
DPR = cash profit per share/earnings per share
It indicates percentage of annual profit which is divided among shareholders in cash.

3.2. Independent Variables
3.2.1.Producer Price Index
Producer price index specifies the change in prices which producer takes for its products every month. Data are determined using polls in various parts, including production, agriculture, mine and urban service. As consumer price index, producer price index compares current price index to a base value as 100. This means that if PPI value is 115, it is 15% higher than the basic value.

Producer price index is in close relationship with market and is considered as an index in current inflation level. As other price indexes, producer price index value can be the indicator of an increase in an interest rate which is considered for fighting against inflation. An increase in the possible interest rates may increase demand for currency as the investment option, since investors can expect higher feedback when an interest rate is increased [10].

This main index doesn't include high variation items such as energy and food, which may distort figures. In addition, it should be noted that PPI report is the first inflation measurement report accessible every month, thus it is often traced carefully since investors seek for inflation pressure indicators, which can change the interest rate [1].

PPI is in close relationship with market and usually is published before CPI figures, and it is attractive since observers use it as a part of consumer inflation index estimation. PPI report has the average effect on the market [1]. If investors feel that figures of this index (without concern about the immediate increase in an interest rate) are an indicator of strong economy, then they expect increased activity in the stock market.

3.2.2. Consumer Price Index
Consumer price index measures changes in price of goods, and services purchased by households or customers. Statistics section of USA Labor Force defines it as measurement of average change in price paid by customers over the time for goods, and services provided for them [11].

CPI is one of the main price indexes for measuring inflation rate and domestic purchasing power of the countries. This index measures changes in price of goods, and services purchased by households or customers. It can be used for designing welfare and social security plans, wage adjustment and mutual contract setting. In order to select goods and services as calculation base, firstly, importance factor of goods and service is calculated using results of household budget examination. Then, they are put in calculation package regarding their weight and pricing capability. Goods and service price index includes three exclusive groups and eight main groups.

Consumer price index can be used as an index (inflation effect adjustment) of the real value of benefits, wage, retirement, for price adjustment and money volume reduction in order to show that changes have real value [10]. This index is used for welfare and social planning and wage adjustment; it is also used as a regulator for fixed price's calculation in national calculations. Thus, especial care is needed in all stages of calculating this index. In some countries, especially in USA and Sweden, philosophy of the index is that this index is derived from correct thoughts in relation to living cost index (fixed desirability), while in some European countries, this index is viewed as a scientific principle.

Goods bosket price change of which is considered in the calculation of this index include important consumption items of urban households. Accurate calculation of an importance factors for each item and average price of item's influences in the accurate calculation of the index considerably, because they are index calculation base.

Importance factor or weight of each item is gained by investigating household budget, which based for these factors are updated annually, but relative price calculation for each good or service should be calculated by arithmetic average method or geometric average method. Difference between these two averages might be little for each item (good or service), but some of these differences cause the remarkable differences in total items.

Generally following relationship is used for calculating this index:
CPI = day price/base price×100
- Application of Price Indexes: Inflation Rate Calculation

Using the price indexes inflation rate is calculated. Inflation rate includes a growth rate of price indexes. For example, if price index is 200 in 1996 and 240 in 1997, then the inflation rate over that year is 20%. 20 percent inflation rate means that prices have been increased by 20% in average over on year (in weight average), or in other words, prices weight average has been increased 1.2 times. Growth rate of price's index within a certain period is called inflation. For instance, if price's index is 500 in 2008 and 600 in 2000, inflation rate during this period is 20%.
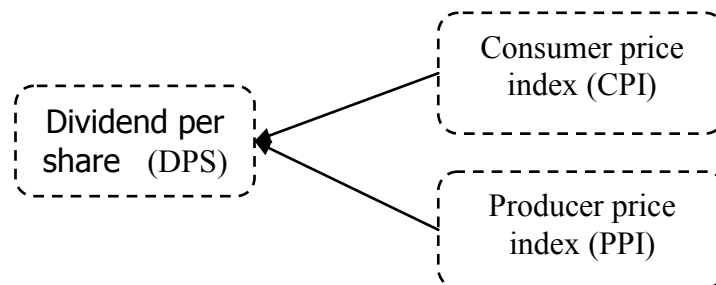
4. HYPOTHESES
H1: There is the relationship between consumer price index and dividend per share.

H2: There is the relationship between producer price index and dividend per share.

5. RESEARCH METHOD

5.1. Research Model

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                                    ┌ ─ ─ ─ ─ ─ ─ ─ ─ ┐
                                      Consumer price
                                    │   index (CPI)   │
                                    └ ─ ─ ─ ─ ─ ─ ─ ─ ┘
┌ ─ ─ ─ ─ ─ ─ ┐
  Dividend per  ◄
│ share  (DPS) │
└ ─ ─ ─ ─ ─ ─ ┘           ┌ ─ ─ ─ ─ ─ ─ ─ ─ ┐
                            Producer price
                          │   index (PPI)   │
                          └ ─ ─ ─ ─ ─ ─ ─ ─ ┘
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5.2. Hypotheses Testing
5.2.1.Time Series Reliability
In common econometric methods, performing any estimation is subjected to be confident about variable's reliability [11]. By definition, a time series is considered reliable if its mean, variance and covariance remains fixed over the time. Generally, if we changed time start point of a series, for example from t to t+m, and its mean, variance and covariance remain intact than that time series is reliable, otherwise, time series is unreliable [11].

Since research nature is of time series type and derived from time-series data, and on the other hand, ordinary least square's method is used for estimation in hypotheses and necessary condition for using a linear regression model in ordinary least square's method is stability of pattern variables, so before testing research hypotheses, reliability and unreliability of research variables should be tested. To this end, Augmented Dicky- Fuller test (ADF) is used. The number of optimal intervals is determined by Schwartz Info Criterion. It is in such a way that the interval which has the highest Schwartz value. It is the best interval [14].

It should be noted that by referring to Prob column (the minimum probability of a hypothesis H0 approval) can also determine rejection or approval of a hypothesis H0. Probe column, the minimum probability of a

hypothesis H0 approval for the respective coefficient being zero, determines that probability is higher than 1 percent, in the significance level of 1 percent, hypothesis H0 cannot be rejected [11]. Hypotheses H_0 and H_1 are stated as follows:

H_0: Respective variable has a unit roots.
H_1: Respective variable doesn't have unit root (static variable)

Results of Dicky- Fuller tests in variable levels are given in table 1.

Variables	Optimal delay numbers	Intercept	Trend	Augmented Dickey-Fuller test statistic	McKinnon Critical value			Prob
					1%	5%	10%	
CPI	Level	+	+	1.395	-3.61	-2.94	-2.609	0.998
PPI	Level	+	+	1.907	-3.621	-2.943	-2.610	0.999
DPS	Level	+	+	-2.146	-3.615	-2.941	-2.609	0.228

Table 1. Results of Dicky- Fuller test for pattern variables

Regarding the value of Prob for all variables, hypothesis H0 is approved. That is, all variables have unit root, then they are not static, thus they should become static by differentiating in higher orders. As a result, Dickey-Fuller test is carried out for a first-order differences of model variables. Table 2 shows results of augmented Dickey-Fuller test for a first-order differences of variables.

Variables	Optimal delay numbers	Intercept	Trend	Augmented Dickey-Fuller test statistic	Test Critical Values			
					1%	5%	10%	Prob
CPI	1	+	+	-3.096	-3.615	-2.941	-2.609	0.035
PPI	1	+	+	-3.936	-3.621	-2.943	-2.610	0.004
DPS	1	+	+	-7.204	-3.621	-2.943	-2.610	0.000

Table 2. Results of Dicky- Fuller test for a first-order differences of variables

Therefore, regarding results of ADF test on the first-order difference of variables, hypothesis H0 is rejected, and hypothesis H1, which states static status for model variables is accepted. Variables all follow the static process in the difference, and they are first grade static (1). Thus, model variables become static by once a difference.

Based on econometric discussions, the existence of serial correlation leads to incorrect estimations of the standard error and subsequently, to incorrect statistical interpretations for equation coefficients. Because there is the probability of serial correlation in these time series, Phillips- Perron's test is applied. This test is used for determining the static state of time series when there is the probability of serial correlation in time series. Hence, there are two hypotheses:

H_0: Respective variable has a unit roots (it is not static)
H_1: Respective variable doesn't have unit root (it is static)

Results of Phillips- Perron's tests are given in table 3.

Variables	Optimal delay numbers	Intercept	Trend	Phillips-Perron test statistic	Test critical values			
					1%	5%	10%	Prob
CPI	Level	+	+	5.64	-4.58	-3.32	-2.80	1.000
PPI	Level	+	+	4.01	-4.58	-3.32	-2.80	1.000
DPS	Level	+	+	-1.34	-4.58	-3.32	-2.80	0.55

Table 3. Results of Phillips-Perron test

Regarding the value of Prob for all variables, hypothesis H0 is approved. That is, all variables have unit root, then they are not static, thus they should become static by differentiating in higher orders. As a result, Phillips- Perron's test is carried out for a first-order differences of variables. Table 4 gives results of Phillips- Perron's test for a first-order differences of variables.

Variables	Optimal delay numbers	Intercept	Trend	Phillips-Perron test statistic	Test critical values			
					1%	5%	10%	Prob
CPI	1	+	+	-1.43	-4.80	-3.40	-2.84	0.044
PPI	1	+	+	-1.35	-4.80	-3.40	-2.84	0.050
DPS	1	+	+	-1.2	-4.80	-3.40	-2.84	0.048

Table 4. A result is Phillips- Perron's test with one order of difference.

Therefore, the hypothesis H0 is rejected and hypotheses H1 states that model variables are static, and it is accepted.

5.2.2. Testing Hypotheses

Correlation is a statistical tool for determining type and grade of relationship between one quantitative variable with another one. Correlation coefficient is one of the criteria used for determining correlation between two variables. It shows relationship severity and type (direct/inverse). It is between 1 to -1, and in case there is no relationship between variables it is zero. In this study, the Pearson's correlation coefficient is used regarding data. This coefficient calculates the level of correlation between two distance or relative variables, value of which is between +1 and -1. If obtained value is positive, it means that changes of both variables are in the same direction; that is, increase in one variable causes increase in another one. And if the value for R is negative, it means that two variables act in opposite directions. That is, increase in one variable causes decrease in values of another variable. Results of investigating the relationship between variables are summarized in table 5.

Hypothesis H_0	Correlation coefficient	t-Statistic	Probability	Approval or rejection
CPI is irrelevant of DPS	-0.683	-4.98	0.0016	Rejection of H_0
PPI is irrelevant of DPS	0.706	5.68	0.0007	Rejection of H_0

Table 5. Results summary of Pearson correlation coefficient

Regarding above table, it is concluded that DPS is in negative significant correlation with CPI (R=-0.68) and in significant positive correlation with PPI (R=0.706). In order to study an effect of variables and influence time, Granger-causality test is used.

One of the main issues in economic studies is finding cause and effect relationship among variables. In regression analysis dependence of one variable to other variables is studied. However, such factors as dependency or causality existence cannot be found by it. There are various methods for determining economic studies, for example, Granger-causality test. Granger defines causality of X in Y regarding Y prediction power. Y is caused of X, if previous values of Y can reduce X prediction error [11]. In this study, Granger-causality test is used following obtaining the correlation among variables for investigating variables influence and delay time. Results of Granger-causality tests are summarized in table 6.

Number	Delays number	One year delay		Two-year delay		Three-year delay		Approval or rejection of H_0
	Causality	F-	Prob	F-	Prob	F-	Prob	

	direction (H_0)	Statistic		Statistic		Statistic		
1	CPI doesn't influence on DPS	0.078	0.01	0.04	0.96	0.09	0.245	One year delay, H_0 rejection
2	PPI doesn't influence on DPS	1.022	0.003	1.082	0.001	1.11	0.04	Without delay, H_0 rejection

Table 5. Results of Granger-causality test

Regarding above results is evident that consumer price index influences on a dividend per share for every firm, however, this influence occurs by one-year delay. That is, consumer price index value influences on the next year dividends per share, and it doesn't influence on the current year's dividends per share. Producer price index influences on a dividend per share without delay. That is, current year's dividend per share is influenced by producer price index of the same year, and there is no delay.

5.3. Sample
Statistical population includes a group of people or objects, which are common in one properly or properties under research, and have relevancy to goal and subject matter [7]. In other words, population is a collection of imagined or real members who result of research are transformed to them [8]. In this research, based on financial information of accepted firms in Tehran stock exchange having following conditions:

1. All firms which have been present in stock exchange since March 2001 to February 2009.
2. Their information is completely available
3. Insurance, banks and investment firms are excluded

Regarding above conditions, the number of population in this study is 200 firms. In order to make sure that the highest volume of sample was calculated, P or ratio of success in community was considered as 0.50, thus total number of sample assuming a limited statistical population is calculated using sampling formula in 0.95 confidence level:

$$n = \frac{N(Z_{\alpha/2})^2.pq}{(N-1)d^2 + \left(Z_{\alpha/2}\right)^2.pq}$$ **and**

$$n = \frac{200 \times (1.96)^2 \times 0.5 \times 0.5}{(199) \times (0.05)^2 + (1.96)^2 \times 0.5 \times 0.5} = 132$$

5.4. Source of Data
For this study, we collected data from the Central Bank of Iran and the Tehran Stock Exchange, we use the electronic archival data provided by TSE. In some cases that, the needed data is incomplete we use the manual archive existed in the TSE's library. We also, acquire a part of needed data from Tadbirpardaz and Sahra (two Iranian Software's).

6. CONCLUSION
In first hypothesis, relationship between dividend per share and consumer price index was studied, and it was found that there is the negative relationship between CPI and DPS. Regarding Granger-causality test it was found that consumer price index influences on a dividend per share with one-year delay, because profit after tax is reduced, which subsequently leads to decrease in dividend per share.

However, it is different about producer price index. In this hypothesis, relationship between dividend per share and producer price index was studied. Unlike our expectation, there was a positive relationship. So, that increase in the producer price index led to increase in this variable. It can be attributed partly to more increase in goods price than in the producer price index. That is, increase in a producer price index leads to

increase in raw material price, and firm is forced to increase price of its goods, but this increased good price is more than the increase in raw Therefore, therefore firm profitability increases, and this in turn leads to increase operational profit and dividend per share. Results for Granger-causality test indicates that producer price index influences on a dividend per share without delay and immediately.

In this study, CPI has a negative relationship and PPI has a positive relationship to dividend per share. Findings of this study are in consistency with previous ones such as Daiz (2009), Sharma (2011), and it is not in consistency with some other showing, there is the not significant relationship between inflation and financial performance, especially stock return..

Recommendations for Future Works
1. Investigating the effect of inflation indexes on firms' profitability in different industries 2. Investigating other inflation indexes such as wholesale price, export price index and, etc. on profitability
2. Investigating the long-term relationship among CPI and PPI and profitability and other financial ratios incom

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