

**‘INFLATION-TARGETING’ POLICY AND RISK
MANAGEMENT IN CORPORATIONS**

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‘INFLATION-TARGETING’ POLICY AND RISK
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‘Enflasyon Hedeflemesi’ Politikası ve Anonim Şirketlerde Risk
Yönetimi

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Abstract

Turkey is in the verge of implementing new monetary policy which is called ‘inflation-targeting’. Although Turkey uses ‘inflation-targeting’ policy implicitly since 2002, the beginning year of explicit ‘inflation-targeting’ policy is 2006. Implementation of explicit ‘inflation-targeting’ policy carries some risks. This paper focuses on the possibility of arising any unexpected inflation in ‘inflation-targeting’ policy.

This paper discusses this problem from producers’ side. The general profit maximization model is modified to show the effects of unexpected CPI inflation and unexpected WPI inflation. By using logistic regression model, it is found that unexpected CPI inflation is not significant in profit changes of Turkish corporations. These results are supported with chi-square test. On the other hand, unexpected WPI inflation is significant in profit changes of Turkish corporations. Another result shows that profit changes are significantly affected by the difference between unexpected CPI inflation and unexpected WPI inflation.

Özet

Türkiye, ‘enflasyon hedeflemesi’ olarak adlandırılan yeni bir uygulamayı yürürlüğe koyma aşamasında bulunmaktadır. ‘Enflasyon hedeflemesi’ 2002 yılından beri örtülü bir şekilde yürürlükte olmasına rağmen, açık ‘enflasyon hedeflemesi’ politikasına geçiş 2006 yılında olacaktır. Açık ‘enflasyon hedeflemesi’ politikasının uygulanması bazı riskleri yanında getirmektedir. Bu makale ‘enflasyon hedeflemesi’ politikasının uygulanması sırasında beklenmedik enflasyonun çıkması ihtimali üzerine odaklanmaktadır.

Makale, bu sorunu üretici tarafından değerlendirmektedir. Genel kar maksimizasyon modeli, beklenmedik TÜFE enflasyonu ve beklenmedik TEFE enflasyonunun etkilerini göstermek amacıyla yeniden düzenlenmiştir. Lojistik regresyon modelinin yardımıyla beklenmedik TÜFE enflasyonunun Türk anonim şirketlerinin karlarının değişiminde etkili olmadığı gösterilmektedir. Diğer yandan, beklenmedik TEFE enflasyonu Türk anonim şirketlerinin karlarının değişiminde etkili bir rol oynamaktadır. Bu sonuçlar Kikare test yöntemiyle desteklenmiştir. Bir diğer sonuç, beklenmedik TÜFE enflasyonu ile beklenmedik TEFE enflasyonu arasındaki farkın anonim şirketlerin karlarının değişiminde etkili olduğunu göstermektedir.

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LIST OF ABBREVIATIONS

CPI		Consumer Price Index
WPI		Wholesale Price Index
LOGIT		Log-linear Regression
SIS		State Institute of Statistics
ε		Error Term
IFRS		International Financial Reporting Services
IASB		International Accounting Standard Board
IMF		International Monetary Fund
ISE		Istanbul Stock Exchange
OLS		Ordinary Least Squares
MLE		Maximum Likelihood Estimation
AIC		Akaike Information Criteria
e		Inflation
e_E		Expected Inflation
e_{err}		Unexpected Inflation

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CHAPTER I

INTRODUCTION

This study focuses on possible effects of inflation on future financial plans of corporations in inflation-targeting countries. Inflation-targeting policy aims to determine future inflation rates. This, obviously, helps corporations to diminish the effect of inflation risk in future plans.

The importance of this analysis is to include unexpected inflation besides expected inflation in this calculation. It is expected such a conclusion that unexpected inflation has significant relationship with profit changes of corporations and therefore unexpected inflation gives harm to future plans. In this paper, the effect of determined future inflation will not be discussed because its effect on future growth plans is obvious.

One of the purposes of any monetary policy is to decrease inflation rates and to keep these rates low to erase the harms of high inflation. However, low inflationary economies could create risk for financial markets and institutions (Saunders 2000). If nominal inflation is close to zero, institutions with higher modified duration of assets than modified duration of liabilities face with inflation risk because only possibility is an increase in nominal interest rate. Under such a circumstance net worth of institution decreases which also leads to decrease in the price of stocks if it has. Not

only net worth but also profitability is under inflation risk. Profitability of an institution such as banks depends on the difference between interest income and interest expense and difference between other income and expenses (Saunders 2000). An increase in inflation from the almost zero level will increase the gap between duration of assets and duration of liabilities which results in decrease of profitability. This is one of the reasons of the importance of 'inflation risk'. In fact, inflation risk is the risk of erosion of purchasing power of money or investment due to the rise in the prices of goods and services. What is quite significant in 'inflation risk' issue is the unexpected increase in inflation. When calculating nominal interest rate we use 'Fisher Equation'. Fisher equation implies that nominal interest rate is the sum of real interest rate and inflation. Fisher equation has been also used to show relations between stock market returns and inflation. However using ex-post data to investigate relations between nominal interest rate or stock market returns and inflation may involve a fault in itself. Using ex-post data may help to prove that there is no relation between stock returns and inflation (Fama and Schwert 1977; Jaffe and Mandelker 1976), but it does not mean that Fisher equation does not work. Gultekin (1983), Saunders (2000), Boudoukh, Richardson and Whitelaw (1994) and many other researches have used ex-ante data to investigate the relationship. Gultekin (1983) points out that expected inflation has significant effect on expected stock returns. Also, there is negative relation between expected inflation and expected real interest rate. That is important in the sense that it is possible to have a guess about growth and returns if ex-ante data are

available. Since only ex-ante data are used unexpected inflation is not included in the calculation. In fact, unexpected inflation has significant and negative effect on ex-post stock return data (Gultekin, 1983). The exclusion of unexpected data from the formula may be a reason of the findings of i.e. Fama and Schwert (1977). Since ex-post data is a combination of expected inflation and unexpected inflation and since these the effects of these two variables on stock returns are quite contrary, total effect may not be determined. Schwert (1981) explains that announcement of unexpected inflation negatively affects stock markets, but the magnitude is small.

On the other hand, Knif, Kolari, and Pynnönen suggest that inflation shocks can cause stock market overreaction at certain times (2001). Basak and Shapiro (2001) argue that VaR risk managers choose larger exposure to riskier assets than non-risk managers. Because of this situation, they face with larger losses when losses incur. The presence of VaR risk managers increases the volatility at down times of market and moderates at times of up markets. This may have impact on overreaction of stock markets to inflation shocks.

Solnik (1983) shows in his survey that real returns are dependent on inflation expectations. Benderly and Zwick (1985) investigates the relationship between inflation and real stock returns. They add that inflation has not independent effect on real stock returns if future growth rates are determined. They agree with Fama's findings that stock market efficiently forecast future economic growth. Chang and Pinegar (1987) also agree with

Fama's findings by saying that future real output growth helps to determine current stock returns.

Boudoukh, Richardson, Whitelaw (1994) have the same opinion that in noncyclical industries expected inflation affects stock returns positively. They add further that in cyclical industries the relation between expected inflation and stock returns turns out to be negative. Brenner and Landskroner (1983) converge the issue from the point of holding-period returns on bonds and inflation uncertainties. By using ex-ante data they find that this relation is positive and highly significant. Titman and Warga (1989) look at the effect of stock returns on interest rates and inflation. They find a significant positive relation between stock returns and future inflation rate changes and also a significant positive relation between stock returns and future interest rate changes. Feldstein (1980) mentions the effects of increases in inflation on prices of stocks from a different viewpoint. The fall in stock prices is not a result of just an increase in inflation. The decrease in the ratio of stock price to earnings due to an increase in inflation is a result of tax regulations and depreciation regulations. Lawlor (1978) points out that an asset beta coefficient becomes unstable when inflation uncertainty increases. Inflation uncertainty leads to changes in purchasing power risk which affects the beta coefficient.

Berument (2001), after mentioning about Fisher hypothesis that expected inflation is related with interest rate, explores the effects of differences between public and private sector pricing behavior on treasury auctions interest rates. The results imply that inflation uncertainty increases

interest rate. Day (1984) ties the relation between expected inflation between expected inflation and expected real returns on the production function of the economy and on the investor preferences. If the economy has constant return to scale production function, the relation between expected inflation and expected real returns turns out negative.

Although 'Fisher equation' gives emphasis on expected inflation, inflation uncertainty draws attention because of its possible effects. Patel and Zeckhauser (1987) try to solve the inflation uncertainty problem by using Treasury bill futures as hedging instruments. Balsam, Kandel, Levy (1998) points out that inflation risk premium depends heavily on the degree of relative risk aversion. It says that inflation expectations depend on relative risk aversiveness because risk premiums are used when calculating expected inflation. Zvi Bodie (1982) investigates the effects of inflation uncertainty over portfolio behaviors. If there is inflation uncertainty, households will demand inflation hedging for assets. An asset is perfectly hedging as long as its nominal return is positively correlated with the rate of inflation. Amihud (1996) emphasizes strong negative relationship between stock price and unexpected inflation. The negative effect of unexpected inflation can be tied to its negative relation with real activity and its real economic cost. Stulz (1986) points out that a decrease in real wealth combined with an increase in expected inflation leads to a decrease in real interest rate and the expected real rate of return of the market portfolio.

Boyd, Levine and Smith (1997) investigate the relationship between inflation and financial market performance. According to this paper, various

measures of financial performance are strongly related with inflation. The measures which have strong negative relationship between inflation are measures of financial sector lending to private sector, the quantity of bank liabilities issued and measures of stock market liquidity. Another result they reach, which is interesting, is that at moderate rates of inflation marginal increases in predictable inflation do not match with increases in nominal equity returns. However, in high-inflationary periods this correlation raises almost one. Finally, they conclude with the finding of positive correlation between stock return volatility and inflation. Kantor (1986) reaches a conclusion that unsystematic inflation risk has not any significant effect on output growth whereas real output growth decreases significantly due to an increase in systematic inflation risk. Main idea behind this conclusion is the ability to eliminate the unsystematic inflation risk by diversification, so that it becomes insignificant. However since the systematic inflation risk covers whole sector, diversification is not possible. Therefore, systematic inflation risk affects output significantly.

The literature shows that inflation is an important topic for academicians who are interesting with economics and/or finance. Inflation is discussed from various points of views, such as inflation shocks or emergence of unexpected inflations. Also, the effect of unexpected inflation in inflation-targeting policy is discussed in macro level. That is, possible results of unexpected inflation on the whole country are shown. This paper sheds light on the effect of unexpected inflation on micro level. In other words, this

paper deals with the effects of unexpected inflation on growth strategies of corporations.

Section I was introduction part in which literature survey was done and explained. Section II includes some important things about inflation-targeting. Types of inflation which were and are used in inflation-targeting countries and significant features of inflation-targeting policy are described in this section. In addition to these topics, the paper talks about the term ‘inflation accounting’ because the period the paper dealt with was a period in which inflation-accounting was used in Turkey. Section III introduces the profit maximization model. Data and methodology is described in Section IV. Results are described in Section V. Section VI is the conclusion.

CHAPTER II

SOME TOPICS ABOUT INFLATION-TARGETING POLICY

II.I. Types of Inflation

Inflation has been a discussion point for decades because of its negative effects on societies. A survey conducted in U.S., Germany and Brazil among different groups from 677 people shed light on views of people about inflation (Shiller 1996). People in those countries were against high inflation because it causes decrease in standards of living by inhibiting economic growth. High inflation can lead political chaos and anarchy since it gives harms to national morale by some ways like decrease in the value of national currency. High inflationary periods are welcomed for some groups in societies. Those groups have the chance to get high profits which leads to misallocation of resources. Misallocation of resources which brings about an increase in the gap between rich and poor groups in society is also a conclusion of wrong price signals. Poor people become poorer and rich people become richer. The decrease in the purchasing power of poor people brings about the welfare problem. Since such groups become less able to get nutrition or to find shelter to protect them, welfare of society decreases.

As Krugman, Persson, and Svensson (1985) argued in their paper, welfare decreases with increase in inflation. Inflation results in reduction of liquidity and cash constraints. Reduction in liquidity and cash constraints leads to misallocation of resources which eventually decreases welfare. Nominal interest rate increases by increase in inflation whereas real interest rate decreases. Nominal interest rate increases in high inflationary areas because of 'liquidity preference'. Real interest rate falls because inflation leads to decrease in liquidity. Therefore, people always prefer low inflation. However, we face another problem here. As Black (1995) pointed out, since nominal interest rate can not be negative, real interest rate gives wrong signals. That is because expected real rate and expected inflation can not be zero. If this is correct and nominal interest rate can not be below zero, then any deflationary situation will lead to misunderstandings (Saunders 2000). For example, a negative inflation will be off-set by positive real interest rate to reach at least zero nominal interest rate. So, the equilibrium between investment and saving becomes disrupted.

Only types of inflation which have been used and are still used by policymakers will be subject to discussion in this paper. The feature that inflation-targeting policy is easily understandable and transparent compared to other monetary policies will be discussed in the coming section. Since the aim of inflation-targeting is to reach the targeted inflation rates, inflation-targeting is easy to understand and also easy to follow. This easiness is one of the important reasons of preferring inflation-targeting policy instead of others. However, there is one crucial point which is still discussed. The

discussion is about which type of inflation should be used in inflation-targeting policy. Freedman (1996) summarized this discussion between to use Consumer Price Index (CPI) inflation and to use a variant of CPI. CPI reflects general price level changes since this index is acquired through combining price changes of many goods and services from different sectors. Because of this relatively easy calculation of CPI and the publication of CPI rates each month this type of inflation is easy to understand by the public. On the other hand, CPI is criticized as it reflects the prices of currently produced goods and services and does not deal with prices of future goods and services. Moreover, recent research suggest that CPI inflation rates tend to overstate the true rate of inflation, due to some problems like substitution bias in the fixed-weight index or failure to account adequately for quality change (Bernanke and Mishkin 1997). Therefore, some countries adapted 'core inflation' which is CPI or WPI inflation excluding some factors. For example, these factors include commodity groups, which exhibits temporarily price jumps.

Canada, for example, focused on an inflation target which was CPI excluding food, energy, and the effect of indirect taxes. It was shown that oil price and real exchange rate were significantly correlated with output growth changes (İşcan & Orsberg 1998). Australia used CPI inflation from which mortgage interest charges were removed. 'Core inflation' is useful against supply shocks because supply shocks increase the price level of a commodity for once but it has a total effect on inflation. It leads to confusion in policy making for policy makers and misperception by public,

if the commodity which suffers from supply shock is not excluded from CPI. DeBelle and Wilkinson (2001), and Bernanke and Mishkin (1997) describe the components of inflation targeted in Australia, Canada, Finland, Israel, New Zealand, Spain, United Kingdom. Canada and Sweden applied 'monetary conditions index' which was a weighted combination of the exchange rate and the nominal short-term interest rate, in conjunction with other standard indicators such as money and credit aggregates, commodity prices, capacity utilization and wage developments (Bernanke and Mishkin 1997). The weight of exchange rate depends on effects of exchange rate changes on prices. Effects of exchange rate will be discussed further below. Countries which are going to set inflation-targeting as their new policy should converge this problem consciously, since although 'core inflation' targets are more helpful to reach long-run targets, they are not understandable and transparent as much as CPI inflation targets which breaks apart the features of inflation-targeting such as transparency and information to public. Generally, most of the countries applied inflation-targeting set CPI inflation as the target.

II.II. Inflation-Targeting Policy

After the application in New Zealand in 1989 inflation-targeting has become one of most attractive monetary policies. Since then more than twenty countries adapted inflation-targeting as their main objective. Australia, Brazil, Canada, Chile, Columbia, Czech Republic, Hungary, Iceland, Israel, Korea, Mexico, Norway, Peru, Philippines, Poland, South Africa, Spain, Sweden, Switzerland, Thailand and United Kingdom chose

inflation-targeting in 1990's and in the beginning of 2000's. Thórarinn G. Pétursson (2004) bounds the popularity of this policy with the ability of this policy to “provide a credible medium-term anchor for inflation expectations while allowing enough flexibility to respond to short-run shocks without jeopardizing the credibility of the framework”¹.

After 1990, hundreds of papers have been written about inflation-targeting from many different viewpoints. Also, many conferences have been organized throughout the world to discuss inflation-targeting. Needless to say, those papers and conferences have dealt with every points of inflation-targeting, such as its advantages, disadvantages, models used for inflation forecasting. This section starts with a short literature survey about inflation-targeting to make it clear what inflation-targeting means.

Many advantages of inflation-targeting have been described as a monetary policy. Compared to other monetary policies like exchange rate targeting or monetary targeting, inflation-targeting is easy to understand for public. It is also quite transparent since the success is measured by the ability of the policy to reach the targeted inflation rate. The success of the policy also depends on the credibility and level of independence of central banks – if central bank is responsible from the policy-. Independency is crucial in the sense that it does not allow governments to follow ‘populist behaviors’. Populist behaviors can be described as policies by governments

¹ Pétursson, T. G. 2004, ‘The Effects of Inflation-targeting on Macroeconomic Performance’, Working Paper No. 23, Central Bank of Iceland, p. 2.

to increase the welfare of the groups which are sources of vote for the ruling parties. Such populist behaviors are short-run policies although they give huge harm in the long-run. Also, fully independent central banks are not influenced by electoral deadlines (Muscatelli 1998). The term of ‘independency’ includes the restriction for central banks to lend to Treasuries and State owned institutions. Credibility, on the other hand, is the extent to which changes in the yield curve reflect expected changes in inflation (Kunter, and Janssen 2002). They conclude that there is no built-in credibility of announcing inflation-targeting. Central banks should work to gain ‘credibility of ability’ in the initial years of inflation-targeting. After gaining ‘credibility of ability’ central banks can more easily reach the goals they set.

The issue of independency is worth to mention further. Not in every inflation-targeting country central banks were left free to take decisions. Brazilian government set inflation targets in consultation with central bank of Brazil whereas Central Bank of Chile was the only institution which set targets. Bank of England granted operational autonomy in 1998 by the Bank of England Act. What the Bank of England has is instrument-independence and goal-dependence (Haldane 2000). The responsibility to set the inflation targets should not be confused by the accountability of central banks in inflation-targeting countries. Starting with New Zealand, central banks in inflation-targeting countries become responsible from implementing the policies through determined tools. Central banks are responsible to reach the targeted inflation rates in predetermined horizon. Reasons of failure should

be announced explicitly by central banks. If the failure does not depend on acceptable reasons, there are some sanctions for central banks. New Zealand government had the right to fire the governor of the central bank in such a situation which can be shown as the hardest sanction. Public announcements play an important role in inflation-targeting. Policy-makers in inflation-targeting country should give information about policies they follow. In example, drafts of Monetary Policy Committee meetings to determine short-term interest rates are published each month. In New Zealand, inflation rates and inflation forecasts were published four times a year. It is important in the sense that if public have enough knowledge and information about policies and indicators for future they will take their steps according to them. This is good for both policy-makers and public. It will be easier for policy-makers to reach targets. Public will benefit from it because they can make long-term growth policies without the danger of possible economic crises.

Also, public announcement hinders the ‘time-inconsistency’ problem. ‘Time-inconsistency’ is defined as the possibility of central banks to switch their policies due to changing conditions instead of keeping the policies they set in previous times unchanged (Mishkin 2000). Information is important not only for public but also for central banks. Central banks should share information they have in order to obey transparency rule, but on the other hand they should look for other information to make conscious forecasts. Dealt with inflation forecasts, central banks should use other information that they can not reach to forecast future inflation rates. In example, private

sector could have different information about inflation forecasts. If central banks benefit from such information, possibility to reach the targeted interest rate levels would be easier than depending only on their own information. However, explicit structural models are required to maintain the policy (Bernanke & Woodford 1997).

Implementation of inflation-targeting policy differs from country to country. The type of inflation rate used in forecasting is one of the implementation differences. Another one is how policy-makers set inflation targets. There are three types of future inflation forecast. First one is point target. If point target is used, expectations for future inflation rates will be definite and exact and so private sector will be more comfortable in making future plans. However, it is not easy to reach the point target. In the circumstances of such a failure, policy-makers lost credibility. Second type is target band. There are a high point and a low point which can also be seen as ceiling and floor. Advantage of using target band is that it provides more flexibility to central banks in monetary policy. On the other hand, a wide band decreases public trust in central bank's ability to decrease inflation. The third choice is to use thick point. This one is between point target and target band. Thick point is either a target point with $(-+1)$ range or a narrow band which has a central point. Check Republic, Israel, Canada, Republic of Korea, Thailand, Chile used target band whereas Brazil, England, Sweden and Norway chose point target. Also, thick point was seen in Australia and Peru. This comparison brings about the idea that more developed countries can choose point targets while less developed ones prefer target band. This

can be combined to the vulnerability of less developed economies to shocks. A more democratic environment or an increase in capital flows could lower inflation deviations (Domaç & Yucel 2004). Less developed countries need more flexibility in monetary policies for possible future shocks. Since highly developed countries have well-structured economies, they are not as prone to economic shocks as less developed countries. Therefore, they can choose point targets.

The strictness of inflation-targeting policy is worth to mention. Strict inflation-targeting focuses only on inflation. So, any deviation in inflation is offset directly by making necessary adjustments in interest rate. Since these adjustments are taken immediately, they cause disruptions in reaching to targeted output levels. If inflation becomes higher than expected level, interest rate will be increased immediately and it will cause in decreasing in output. Otherwise, interest rate should be decreased and it will end with higher output than expected. Guy Debelle (1999) mentions about negative short-run trade off. According to him, bringing down the inflation rate to targeted level increases volatility in output. Flexible inflation-targeting follows a more moderate way. It aims to reach not short-term targets but medium and long-term targets. Flexible inflation-targeting focuses not only on inflation but also other indicators like output. Therefore, since not any direct adjustment is made after any shock affecting inflation target, it will be much easier to reach medium and long-run targets for both inflation and output. Main difference between strict and flexible inflation-targeting is the focus point of policy-makers. Strict inflation-targeting focuses only on

inflation whereas flexible inflation-targeting looks other indicators than inflation. Implementation of inflation-targeting is also divided as 'policy of rules' and 'discretionary' policies. Bernanke and Mishkin (1997) define inflation-targeting as a framework for monetary policy within which 'constrained discretion' can be exercised. This type of well-designed inflation-targeting strategy will diminish some problems of inflation-targeting which are described as disadvantages such as too much discretion, too rigid inflation-targeting, low economic growth, and high output volatility (Mishkin 2000).

Fiscal policies play important role in the success of inflation-targeting. Implementing inflation-targeting policy without diminishing government expenditures and setting fiscal discipline brings about harms more than benefits in long-run. Especially if a country faces with fiscal deficit, any devaluation in exchange rate will cause to abandonment of the current program. This will come with huge harms. First of all, government and central bank will lose public trust. The loss of public trust will be a reason of difficulty in implementing in possible future economical stabilization programs. Secondly, devaluation will increase the fiscal deficit and so, more capital will be required to pay the debts. The requirement for more capital will lead to increase in interest rates and so inflation will increase in long-run. It means that all the policies and works made to implement inflation-targeting will be disappear and government should start again to reduce inflation, maybe from higher rates.

This paper started discussing the effects of inflation-targeting on output and inflation before in the part where strict and flexible types of inflation-targeting were described. Here in this part, I try to explain the output and inflation lags under inflation-targeting regime. Whether strict or flexible inflation-targeting is applied, the amount of time it takes to affect output and inflation due to changes in a monetary policy should be known. Svensson (1997), in his studies, finds that lag on inflation is two years whereas time lag decreases one year in output. It reflects the fact that output is affected faster than inflation. It leads me to think that inflation should not be the sole target as strict inflation-targeting assumes, since focusing short-run targets could finish with undesired results. Svensson (1997) concludes that the lag problem can be solved only by making two-year forecasting. By setting intermediate targets, volatility in output and also volatility in inflation decreases. Batini and Nelson (2000) also suggests medium-term targets in 'inflation-targeting' policy. Andrew Haldane finds out that any change in short-term interest rate affects inflation in two years in developed countries, whereas this time lag decreases in developing countries (2000). He shows one of the reasons such that in developing countries there is greater degree of price flexibility. However, experiences in inflation-targeting countries do not combine with Haldane's findings. On average, developed countries reach their long-run targets in three quarters while it takes seven quarters in developing countries.

Economic shocks can disrupt implementation of inflation-targeting policy. Inflation-targeting countries should have some policies against

economic shocks. In this paper, demand and supply side shocks are discussed separately. Demand side shocks don't cause big problems for policy-makers in inflation-targeting countries. Demand side shocks occur because of an increase or a decrease in buyers' demands. There are several reasons of a change in buyers' demands.

Some of them are changes in buyers' incomes, changes in buyers' preferences, changes in buyers' expectations and an increase in the numbers of buyers. If these determinants are in an increasing trend, then a positive demand shock should be expected. A positive demand shock increases both the output and prices of commodities. Otherwise, a decreasing trend in such determinants leads to a negative demand shock which causes decreases in output and prices of commodities. Although demand shocks have negative results, it is easy to deal with demand shocks compared to supply shocks because demand shocks do not create trade-off between inflation and output. Therefore, tightening (when there is positive demand shock) or loosening (when there is negative demand shock) the policy moderates inflation and output. However, the amount of the adjustment on interest rates changes the variability on inflation and output (Debelle 1999). The less the response on interest rate is, the greater inflation variability and the less output variability can be seen. The relationship between output, inflation and short-term interest rate is formulized by Taylor in 1993². 'Taylor rule' (1993) is familiar since it is simple and easily understandable. 'Taylor rule' assumes

² A simple 'Taylor rule' is formulated as:
$$r = r^* + \lambda (y - y^*) + \beta (\pi - \pi^*)$$
where r is nominal short-term interest rate, r^* is forecasted nominal interest rate, y is the output level, y^* is the potential level of output, π and π^* are inflation and inflation forecast, respectively. β and λ are coefficients. (Usta 2003). Also look at Benhabib & Grohe & Uribe (2003) and Woodford (2001) about Taylor rule.

an increase in short-term interest rate when either inflation rate is above than expected inflation rate or output level exceeds the potential level. Fuhrer and Moore (1995), by using another model, shows the same relationship between inflation and short-term interest rate. Otherwise, the interest rate should be pulled down. Supply shocks, on the other hand, are difficult to smooth. Supply shocks can be described as a sudden increase or decrease in the supply of a particular good. A sudden increase or decrease in the supply of that particular good directly affects the price of this good which results in the change of inflation. Supply shocks are unlikely to create problems in output and prices in long-run, but short-run effects of supply side shocks could be harmful. A contraction in the oil production increases price of oil which brings about increase in inflation because oil is almost the most important factor in production. An increase in the price of such an important raw material makes prices of other goods increase which means increase in inflation. Moreover, in this example, a contraction means a decrease in the amount of output with increase in prices. So, there is trade-off between output and inflation. This is hard to solve for policy-makers.

Andrew Haldane (2000) summarizes country experiments against supply-side shocks in three approaches. First one is, to drop the goods that are affected from supply shocks and affect inflation from aggregate inflation. Second approach is to allow greater inflation variation during supply side shocks while keeping medium and long-run targets unchanged. Third approach is to increase the inflation forecast horizon. This approach aims to reach targets over a longer horizon than expected when there is a

large supply side shock. As long as medium and long-run targets are focused, effects of supply side shocks are negligible.

There is one other indicator we should take into consideration. Exchange rate can have impacts on inflation through traded goods. Exchange rate gets more importance if a country depends on raw materials and unfinished goods a lot. Of course, imports of raw materials and unfinished goods and exports of finished goods are desirable for every country. However, if companies depend on foreign materials in production, exchange rate becomes an important thing to think over. Exchange rate is also crucial in inflation-targeting policy because there are many goods affected from exchange rate which are used in calculating inflation rate. That's why dropping the goods that are prone to exchange rate changes from aggregate inflation seems as an appropriate solution to diminish exchange rate effects (Debelle & Wilkinson 2001). This advice misses one point. Before dropping such goods which prices changes by exchange rate changes, the amount of effect of exchange rate changes on both aggregate and non-traded inflations should be known. The weight of exchange rate could be calculated by calculating the effect of exchange rate on prices of goods (Duman 2002). If import goods are spread in consumer goods market in huge amounts, then the effect of exchange rate changes will be high. In such a circumstance, targeting aggregate inflation will be a failure since exchange rate changes will create difficulties in making right and meaningful forecasting. Also, reaching to targeted inflation levels will be more difficult. Another research compares CPI inflation with domestic price inflation. This research, which

uses New Zealand's data, suggests using domestic price inflation instead of using CPI inflation which is affected from exchange rate changes (Conway & Drew & Hunt & Scott 1998). Using domestic price inflation reduces volatilities of inflation, output, and interest rates. Some other researchers focus on another point of exchange rate issue. They discuss which exchange rate policy is more appropriate for inflation-targeting countries. Pétursson (2004), for example, explains that applying floating exchange rate in inflation-targeting countries reduces exchange rate volatility. Since exchange rate volatility decreases, changes in the prices of traded goods won't affect aggregate inflation. So, aggregate inflation becomes usable in such countries. Floating exchange rate policy brings the problem of central bank intervention in foreign exchange market with. Although central bank intervention in foreign exchange market conflicts with the liberalization of markets, paper of Domaç and Mendoza (2004) tells us that fair and understandable interventions could create some benefits. Domaç and Mendoza (2004), in their paper, discussed the intervention to the foreign exchange market in Mexico and Turkey. They reached the solution that overall intervention operations during floating regime had highly significant effect on the exchange rates. Also volatility in exchange rates decreased when intervention was done- volatility decreases as long as sales of foreign exchange are done, otherwise volatility does not decrease-. Dominguez's paper (1998) indicates that the volatility in exchange rates will decrease only if central banks intervene to reduce volatility and this intervention is credible and unambiguous.

Turkey introduced 'inflation-targeting' policy implicitly on 2nd January 2002. The press publication released on that day announced that Turkey was going to use a policy focusing on future period inflation while applying monetary targeting. This can be seen as an implicit inflation-targeting. Since Turkey is an IMF policy-applying country, net domestic assets and net international reserves get importance. Brazil was the first inflation-targeting policy applying country with IMF support. Blejer, Leone, Rabanal, Schwartz (2002) suggests that there should be a ceiling on net domestic assets and a floor for net international reserves. The ceiling on net domestic assets keeps money base (or monetary base) under control. There should be a floor for net international reserves in order to prevent from possible shocks. At the same time, net international reserves are a projection for the success of the external objective of the country. NDA is applied to prevent the success in the external objective from any danger due to excessive credit. Edwards (1999) discusses a control on capital inflow. The example in Chile shows that such a control does not work as expected. It does not have important effects on the success of monetary policy. The control on capital inflow has not any significant effect on exchange rate whereas it affects interest rate quite little. Moreover, this control results in increase in the cost of borrowing.

By the beginning of 2006 Turkey will introduce 'explicit' inflation-targeting policy. The difference from 'implicit' inflation-targeting policy is that these inflation rates will be the sole aim of policymakers and they will be responsible from any failure that unable reaching targeted inflation rates.

‘Implicit’ inflation-targeting policy, on the other hand, provides policymakers the comfort that any failure in reaching targeted inflation rates do not weaken the authority of policymakers because inflation targets are not the only aim of the policymakers.

II.III. Inflation Accounting

Inflation, as discussed earlier, results in a decline in the purchasing power of a country’s currency. Therefore, inflation has an important part in preparing financial statements. International Accounting Standards Board gives emphasize on the ‘inflation’ issue, especially in hyperinflationary countries –International Financial Reporting Standard 29³ aims to deal with inflation accounting. Historical cost-based financial statements can be misleading in high inflationary countries. If historical cost based accounting is applied, all assets and liabilities are recorded at time of acquisition. So, while inflation is disregarded, financial statements don’t reflect exact financial situation of companies.

There are two ways to apply inflation accounting. First one is current cost approach which takes the level of costs and prices for each individual firm to calculate price changes. Current cost accounting is based upon the reflection of all non-monetary assets at their current cost at the date of balance sheet and the differentiation between current cost income from operations and changes is current cost amounts. This approach includes adjustment of non-monetary assets whereas keeping monetary assets’ face

³ IASB makes the using of IFRS29 compulsory in hyperinflationary periods. Cumulative inflation for last three years should be higher than 100% and the last year inflation rate should be higher than 10% to be accepted as hyperinflationary country.

value unchanged. Second approach is the general price-level accounting approach. The objective of general price-level accounting is to adjust all historic amounts into common purchasing power units using a general price level index acquired through focusing price changes of a basket of goods and services at various point of times. Prices of non-monetary assets change with the amount of change in the general price level change, but monetary items are kept fixed in amount.

Current Purchasing Power Accounting, on the other hand, adjusts all non-monetary items from historical costs to current costs by applying general purchasing power index- Wholesale Price Index⁴ is used in restating non-monetary items. Monetary items are kept constant, but net monetary assets or liabilities lead to loss or gain with price changes. This gain or loss should be reflected in financial statements. The difference between total monetary assets and total monetary liabilities is the net monetary assets. If total monetary liabilities are higher than total monetary assets, there emerges a gain on net monetary assets. Otherwise, if total monetary assets are higher than total monetary liabilities, loss on net monetary assets will occur. Logic behind the loss or gain on net monetary assets is that if there is inflation, holding monetary items should carry a cost. Although face value of such items do not change, the change in the purchasing power due to an increase

⁴ There is a need for adjustment factor to make necessary adjustments in financial statements. We use wholesale price index (WPI) in calculating this adjustment factor. The formula used is:

$$AF = \frac{WPI \text{ at balance-sheet date}}{WPI \text{ at transaction date}}$$

or a decrease in inflation level should create a gain or loss which is reflected as net monetary assets in financial statements.

Current purchasing power accounting looks at balance sheet, income statement, statement of cash flow and statement of cost of sales and makes necessary adjustments. All the non-monetary and monetary items in these financial statements are revised according to this approach. For example, since fixed assets, inventory, share capital (to protect the rights of shareholders) and reserves are non-monetary assets, they require adjustment. Trade receivables, debentures, current liabilities, preference liabilities and etc. (which are examples of monetary items) are not restated, but gain or loss on net monetary assets is calculated.

Inflation accounting takes part in this paper, because Turkey suffered from high inflation in the period between 1998 and 2004. Since the research part deals with balance sheets of corporations in this time interval, inflation-adjusted balance sheets are taken into consideration. Otherwise, it will be impossible to see the effects of inflation on balance sheets of corporations. As described many times, inflation is an important factor in financial planning. That's why inflation-adjusted balance sheets imply exactly what happened to corporations' plans in high inflationary periods.

CHAPTER III

MODEL

III.I. Profit Maximization and Effects of Unexpected Inflation

What is written until now is only an introduction for the research topic. This paper aims to investigate whether corporations are able to make future growth plans depending on inflation expectations. This paper assumes that corporations make growth plans as profit maximization plans. While making financial planning, corporations or firms can choose the aim either as maximizing the market value of the firm or corporation (which means maximizing the market value of stocks) or to maximize profits. Financial planning is difficult in the sense that there are many unknown variables which should be forecasted while planning. A firm or corporation should make consistent estimations about future sales, increase in the prices of raw materials, capital structures and etc. These three examples show that inflation is an important variable because it has effects on each of them. An increase in the consumer price index leads to a decrease in the sales, whereas an increase in the wholesale price index brings about an increase in the production cost. That's why inflation should be considered well in financial planning. (Akguc 1989)

Financial planning requires consistently and almost correctly prepared performance financial statements. Performance financial statements are based on estimations about future periods. Especially performance cash flow statement, performance income statement and performance budget are very important in financial planning. Performance income statement and performance cash flow statement plays significant role in deciding future profit targets. Higher profit means strong financial situations of corporations. It helps corporations to grow further and to be stronger in competition with other corporations. To what inflation causes is the deterioration in these performance financial statements and so preventing firms to reach profit targets.

The general profit maximization model is as follow:

$$\pi = p * q - c * q - F \quad (1.1)$$

where,

π = profit of the corporation,

p = unit price,

c = unit cost,

F = fixed cost,

q = quantity

To be able to see the effect of inflation in financial planning, it is needed to put the inflation into to the general model. As discussed by Erdogan, Berk and Katircioglu (2000), the impact of inflation resulting from periods should be considered in the calculation. Moreover, inflation may have significant

effect on the changes of companies' performances operating in different sectors. Some aspects of the calculation of inflation were also discussed by De-Villiers (1997) and Levonian (1994). The involvement of inflation in the general profit maximization model gives us the real profit model.

$$\pi_r = \frac{p * q - c * q - F}{1 + e} \quad (1.2)$$

where,

π_r is real profit,

e is inflation

Since this paper investigates CPI inflation and Wholesale Price Index inflation separately, inflation is divided into two concepts. First one is CPI for sales and second one is WPI for cost of production. The separation is made from the viewpoint of producers (here in this paper from the viewpoint of firms or corporations).

$$\pi_r = \frac{p * q}{1 + e_{cpi}} - \frac{c * q}{1 + e_{wpi}} - \frac{F}{1 + e_{wpi}} \quad (1.3)$$

This representation is more appropriate because price of goods sold is affected by consumer price index and cost of goods sold and fixed costs are affected by wholesale price index.

Now, we are able to see the effects of CPI and WPI separately. However, since we look for the relation between unexpected inflation and changes in profits of corporations, we need to put unexpected inflations into the formula. So;

$$\pi = \frac{p^*q}{(1+e_{E(cpi)})*(1+e_{err(cpi)})} - \frac{c^*q}{(1+e_{E(wpi)})*(1+e_{err(wpi)})} - \frac{F}{(1+e_{E(wpi)})*(1+e_{err(wpi)})} \quad (1.4)$$

We are going to use this equation. This equation includes expected inflation rates and unexpected inflation rates for both consumer price index and wholesale price index. In inflation-targeting policy, expected inflation rates will be constant or will fluctuate in a narrow band. Change in CPI inflation affects price of goods sold. Therefore, an increase in CPI inflation increases prices of goods sold. This helps companies to earn higher profits than expected. However, since expected CPI inflation is decided in the beginning of the year, it is taken constant in this paper. Equation 1.6, on the other hand, shows the amount of effect of a change in unexpected CPI inflation on the change of profit.⁵

$$\frac{d\pi_r}{d\pi_{e_{E(cpi)}}} = - \left[\left(\frac{(p^*q) * (1 + e_{err(cpi)})}{((1 + e_{E(cpi)}) * (1 + e_{err(cpi)}))^2} \right) \right] \quad (1.5)$$

$$\frac{d\pi_r}{d\pi_{e_{err(cpi)}}} = - \left[\left(\frac{(p^*q) * (1 + e_{E(cpi)})}{((1 + e_{E(cpi)}) * (1 + e_{err(cpi)}))^2} \right) \right] \quad (1.6)$$

Equations 1.7 and 1.8 are the derivations of real profit according to expected WPI inflation and unexpected WPI inflation, respectively. Expected WPI inflation will be kept constant because of the same argument applied to the expected CPI inflation. Corporations should know the amount of WPI inflation under inflation-targeting policy at the beginning of the year

⁵ Cerit, C. 2000, 'Çözümlü Diferansiyel Denklemler Problemleri', İ.T.Ü. Fen-Edebiyat Fakültesi, 2nd edition.

to be able to make plans for the whole year. This is the reason expected WPI inflation kept constant. However, the model includes unexpected WPI inflation to show the possible effects of a change in the WPI inflation. It is obvious that an increase in WPI inflation deteriorates profit expectations because of increases in the cost of production.

$$\frac{d\pi}{d\epsilon_{E(wpi)}} = - \left[\left[- \frac{(c * q) * (1 + \epsilon_{err(wpi)})}{((1 + \epsilon_{E(wpi)}) * (1 + \epsilon_{err(wpi)}))^2} \right] + \left[- \frac{F * (1 + \epsilon_{err(wpi)})}{((1 + \epsilon_{E(wpi)}) * (1 + \epsilon_{err(wpi)}))^2} \right] \right] \quad (1.7)$$

$$\frac{d\pi}{d\epsilon_{err(wpi)}} = - \left[\left[- \frac{(c * q) * (1 + \epsilon_{E(wpi)})}{((1 + \epsilon_{E(wpi)}) * (1 + \epsilon_{err(wpi)}))^2} \right] + \left[- \frac{F * (1 + \epsilon_{E(wpi)})}{((1 + \epsilon_{E(wpi)}) * (1 + \epsilon_{err(wpi)}))^2} \right] \right] \quad (1.8)$$

The amount of change in profit according to a change in unexpected WPI inflation is given in equation 1.8. The model can go further to find the relation between unexpected CPI inflation and unexpected WPI inflation.

From equation 1.6., we can get the equation;

$$0 = - \left[\frac{p * q}{((1 + \epsilon_{E(cpi)}) * (1 + \epsilon_{err(cpi)}))^2} * (1 + \epsilon_{E(cpi)}) \right] \quad (1.9)$$

From equation 1.8., we get the equation,

$$0 = - \left[\left[- \frac{(c * q) * (1 + \epsilon_{E(wpi)})}{((1 + \epsilon_{E(wpi)}) * (1 + \epsilon_{err(wpi)}))^2} \right] + \left[- \frac{F * (1 + \epsilon_{E(wpi)})}{((1 + \epsilon_{E(wpi)}) * (1 + \epsilon_{err(wpi)}))^2} \right] \right] \quad (1.10)$$

Getting them together we get,

$$\frac{1 + \epsilon_{err(cpi)}}{1 + \epsilon_{err(wpi)}} = \left(\frac{1 + \epsilon_{E(cpi)}}{1 + \epsilon_{E(wpi)}} \right) * \left(\sqrt{\frac{(p * q) * (1 + \epsilon_{E(cpi)})}{(1 + \epsilon_{E(wpi)}) * (F + (c * q))}} \right) \quad (1.11)$$

The last equation gives the relationship between unexpected CPI inflation and unexpected WPI inflation. This equation shows that an increase in unexpected CPI inflation leads to an increase in prices –because expected CPI inflation and quantity are constant and can not change– which results in an increase in profit. On the other hand, an increase in unexpected WPI inflation leads to an increase in either fixed cost or unit cost or so profit decreases. Therefore, it is expected that if the difference between unexpected CPI inflation and unexpected WPI inflation increases, it will lead to an increase in the profit expectations. This is because of a higher increase in the earnings compared to increase in the costs.

This paper takes expected inflations, prices of goods sold; costs of goods sold and fixed costs constant. Expected inflations, as explained above, are constant because they are decided at the beginning of the period and therefore it is impossible to change them after announcement. Prices and costs are kept constant in order to show the effects of change in unexpected inflations. The last equation tells that changes in unexpected inflations should affect profit changes. The paper will go further to investigate whether such effects are significant or not. If changes in unexpected inflation are significant hypothesis will be verified.

CHAPTER IV

DATA AND METHODOLOGY

We are going to investigate whether changes in profits have something common with changes in unexpected inflations. Data used in this paper represent profits of more than 100 ISE (Istanbul Stock Exchange) corporations between 1998 and 2004 are taken. The profits are taken from balance sheets of corporations which are posted by Istanbul Stock Exchange. Profits before taxes are used. Exact number of corporations used in this paper is 136. These corporations are selected randomly and the amount of corporations used in this paper represents 43% of corporations which issue stocks in ISE. Data about expected inflation are taken from SIS's (State Institute of Statistics) Real Sector Survey. Producers from many different sectors participated in the survey and answered a lot of questions including their expectations about inflation in sales and production units for the current month. Only the expectations for the whole sector are used in calculations in this paper. The graphs below show expected and realized inflation rates for both Consumer Price Index and Wholesale Price Index. At the first glance, it is easy to see that inflation was mostly underestimated, especially in expectations about CPI inflation. First graph shows that while approaching to the current time the gap between expected CPI inflation and

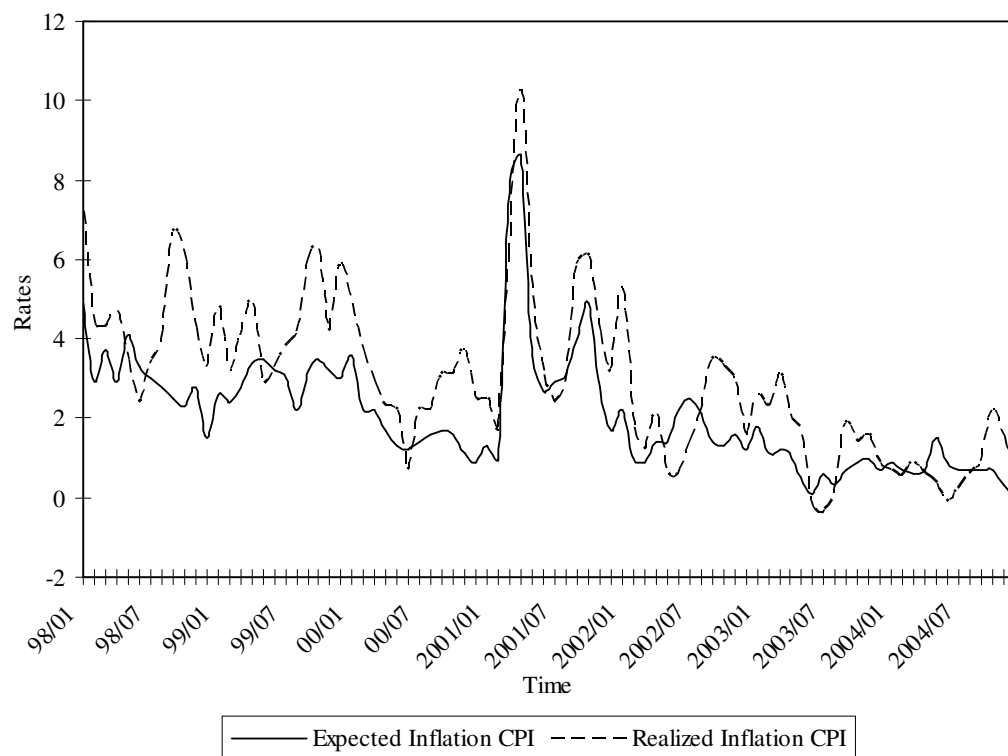
realized CPI inflation decreases. Especially after the year of 2003, both realized and expected inflation rates smoothened and this affected the decrease of the gap between these two inflation rates. On the other hand, underestimation is not a problem for Wholesale Price Index. Table 1 categorizes months according to underestimation and overestimation. As can be seen from Table 1, producers underestimated CPI inflation in 64 months and overestimated CPI inflation in 20 months. Underestimation of CPI inflation is almost 3 times bigger than overestimation of CPI inflation. This proportion changes completely, when we do the same application for WPI inflation. Producers overestimated WPI inflation in 45 months and underestimated WPI inflation in 36 months. This can be a problem if CPI inflation will be the target of inflation-targeting policy.

The model emphasizes the requirement of unexpected CPI and WPI inflation rates. These inflation rates are calculated by dividing realized inflation rates by expected inflation rates. Before explaining methodology, I would like to make some explanations. First, data we have is not too much. Unfortunately, yearly expected and unexpected inflation rates could not be found. After 2001, Turkish Republic Central Bank arranged a monthly survey in which only permitted correspondents (these are big financial institutions and banks) express their monthly and yearly expectations each month. However, data this paper used didn't include yearly expectations for each month and therefore, an assumption is made here. The mean of monthly expectations are taken for each year between 1998 and 2004 and the changes between these means are accepted as the changes of yearly

expectations between these years. This assumption is arranged in the way that unexpected monthly inflation rates are found before and then the mean for each year is gotten. It allows us to solve the lack of yearly expected inflation rates. It is assumed that changes in the mean of monthly unexpected inflation rates are same with the changes in the mean of yearly unexpected inflation rates. Since the changes between the years become important, such a solution seems applicable.

GRAPH 1

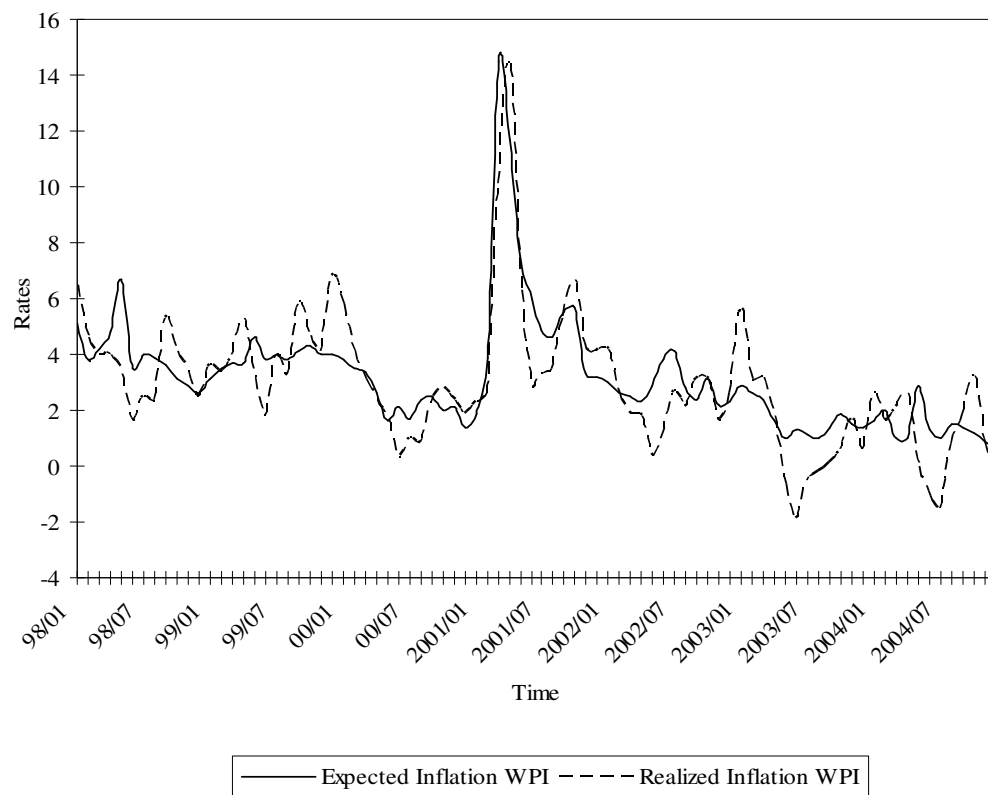
Expected-Realized CPI Inflation between the years 1998 and 2004



Source: State Institute of Statistics

GRAPH 2

Expected-Realized WPI Inflation between the years 1998 and 2004



Source: State Institute of Statistics

TABLE 1
Number of Months Categorized According to Over-and Underestimation

Types of Inflation Number of Months	Consumer Price Index	Wholesale Price Index
Number of Months Underestimated	64 months	36 months
Number of Months Overestimated	20 months	45 months

Adding to the unexpected CPI and WPI inflations, expected CPI, realized CPI, expected WPI, and realized WPI inflations, net sales of corporations for each year and the probability that unexpected CPI inflation is higher than unexpected WPI inflation is added in the research. Although the aim is to show the possible effects of unexpected CPI and WPI inflations on profit changes, and therefore other variables like expected CPI and WPI inflations are kept constant, it will be meaningful to put them in the model just to show their effects if they have. Net sales of corporations are also taken into calculation as a size indicator.

The methodology applied in this paper is logistic regression model⁶. Logistic regression model aims to correctly predict the category of outcome for individual cases. Therefore, it assumes a model that includes all

⁶ Information about logistic regression can be found at the web site: “Logistic Regression”, <http://www2.chass.ncsu.edu/garson/pa765/logistic.htm>

predictor variables that are useful in predicting the response variable. Logistic regression model predicts group membership. Logistic regression model calculates the probability of success over the probability of failure and so, the results of the analysis are in the form of an odds ratio. Logistic regression also provides knowledge of the relationships and strengths among the variables. This second feature is the reason why this model is used in this paper. Logistic regression model can test the fit of the model after each coefficient is added or deleted, called stepwise regression. Stepwise regression is used in the exploratory phase of research but it is not recommended for theory testing (Menard 1995). However, stepwise regression is applied to show possible relationships between independent factors and dependent factor.

Logistic regression model is crucial for this paper because it helps to overcome many of the restrictive assumptions of OLS regression. First, the dependent variable need not be normally distributed. Second, logistic regression does not assume a linear relationship between the dependents and the independents. It may handle nonlinear effects even when exponential and polynomial terms are not explicitly added as additional independents because the logit link function on the left-hand side of the logistic regression equation is non-linear. Thirdly, the dependent variable need not be homoskedastic for each level of the independents; that is, there is no homogeneity of variance assumption. Fourth one is that normally distributed error terms are not assumed. Another is that logistic regression does not

require that the independents be interval. Finally, it is not required that the independents be unbounded.

However, other assumptions of OLS regression are common. First, logistic coefficients will be difficult to interpret if they are not coded meaningfully. The dependent class should be of greatest interest as and the other class as zero because of the usage of probability. Secondly, under the circumstances that relevant variables are omitted, the common variance they share with included variables may be wrongly attributed to those variables. Thirdly, if irrelevant variables are included in the model, the common variance they share with included variables may be wrongly attributed to the irrelevant variables. It means that increase in the correlation of the irrelevant variables with other independents leads to an increase in standard errors of regression coefficients for the independent variables. Violations of this assumption can have serious effects. Fourthly, it will be better to assume low measurement error and not any missing cases.

Logistic regression does not require linear relationships between the independents and the dependent, as explained earlier, but it does assume a linear relationship between the logit of the independents and the dependent. If the linearity in the logits is violated, the model underestimates the degree of relationship between independent variables and dependent variable. If one independent is a linear function of another independent, the problem of multicollinearity will occur in logistic regression. Multicollinearity does not change the estimates of the coefficients. It affects only their reliability. Another problem is that outliers can affect results significantly. Also,

logistic regression uses maximum likelihood estimation rather than ordinary least squares to derive parameters. MLE relies on large-sample asymptotic normality which means that reliability of estimates decline when there are few cases for each observed combination of independent variables. That is, in small samples one may get high standard errors. Moreover, if there are too few cases relating with the number of variables, it may be impossible to get solution. On the other hand, very high parameter estimates may signal inadequate sample size. In logistic regression model the expected variance of the dependent can be compared to the observed variance. If there is moderate discrepancy, standard errors will be over-optimistic and one should use adjusted standard error. Adjusted standard error will make the confidence intervals bigger.

The "logit" model is formulated as:

$$\ln \left[\frac{p}{1-p} \right] = a + bx + e \quad (2.1)$$

or

$$\left[\frac{p}{1-p} \right] = \exp(a + bx + e) \quad (2.2)$$

where,

ln is the natural logarithm,

p is the probability that the event Y occurs, $p(Y=1)$

$p/(1-p)$ is the "odds ratio"

$\ln [p/(1-p)]$ is the log odds ratio, or "logit"

Depending to this formulation, the model is restructured according to the variables of this paper. First of all, the effects of unexpected CPI and WPI inflations and the difference between unexpected CPI and WPI inflation on profit changes are formulated separately.

$$\ln \left[\frac{p}{1-p} \right] = k + ex_1 + \varepsilon \quad (2.3)$$

where,

p is the probability that corporations increase their profits according to the last year,

e is the coefficient of unexpected CPI inflation,

x_1 is unexpected CPI inflation,

ε is the error term.

$$\ln \left[\frac{p}{1-p} \right] = k + hx_1 + \varepsilon \quad (2.4)$$

where,

p is the probability that corporations increase their profits according to the last year,

h is the coefficient of unexpected WPI inflation,

x_1 is unexpected WPI inflation,

ε is the error term.

$$\ln \left[\frac{p}{1-p} \right] = k + jx_1 + \varepsilon \quad (2.5)$$

where,

p is the probability that corporations increase their profits according to the last year,

j is the coefficient of the probability that unexpected CPI inflation is higher than unexpected WPI inflation,

x_1 is the probability that unexpected CPI inflation is higher than unexpected WPI inflation,

ε is the error term.

Then, the model is restructured to see if expected and unexpected inflations have any impact on profit changes. To note that, beginning from this equation more than one variable is included in the model. Therefore, it should be taken into account that the model used may have multicollinearity problem. Also, the equations shown until now are more important for this paper because the results of these equations will show whether the hypothesis is accepted or not. Keeping this in mind, if there are only expected and unexpected CPI inflations, the model will be,

$$\ln \left[\frac{p}{1-p} \right] = k + cx_1 + ex_2 + \varepsilon$$

(2.6)

where,

p is the probability that corporations increase their profits according to the last year,

c is the coefficient of expected CPI inflation,

e is the coefficient unexpected CPI inflation,

x_1 is expected CPI inflation,

x_2 is unexpected CPI inflation,

ε is the error term.

If there are expected and unexpected WPI inflations, the model will be,

$$\ln \left[\frac{p}{1-p} \right] = k + fx_1 + hx_2 + \varepsilon$$

(2.7)

where,

p is the probability that corporations increase their profits according to the last year,

f is the coefficient of expected WPI inflation,

h is the coefficient unexpected WPI inflation,

x_1 is expected WPI inflation,

x_2 is unexpected WPI inflation,

ε is the error term.

If expected and unexpected CPI and WPI inflations are put together, the model will be,

$$\ln\left[\frac{p}{1-p}\right] = k + cx_1 + ex_2 + fx_3 + hx_4 + \varepsilon \quad (2.8)$$

where,

p is the probability that corporations increase their profits according to the last year,

c is the coefficient of expected CPI inflation,

e is the coefficient of unexpected CPI inflation,

f is the coefficient of expected WPI inflation,

h is the coefficient of unexpected WPI inflation,

x_1 is expected CPI inflation,

x_2 unexpected CPI inflation,

x_3 expected WPI inflation,

x_4 unexpected WPI inflation,

ε is the error term.

And if all independent variables put into the model, it will be as,

$$\ln\left[\frac{p}{1-p}\right] = k + cx_1 + dx_2 + ex_3 + fx_4 + gx_5 + hx_6 + ix_7 + jx_8 + \varepsilon \quad (2.9)$$

where,

p is the probability that corporations increase their profits according to the last year,

c is the coefficient of expected CPI inflation,

d is the coefficient of realized CPI inflation,
 e is the coefficient of unexpected CPI inflation,
 f is the coefficient of expected WPI inflation,
 g is the coefficient of realized WPI inflation,
 h is the coefficient of unexpected WPI inflation,
 I is the coefficient of net sales of corporations,
 j is the coefficient of the probability that unexpected CPI inflation is higher than unexpected WPI inflation,
 x_1 is expected CPI inflation,
 x_2 realized CPI inflation,
 x_3 is unexpected CPI inflation,
 x_4 is expected WPI inflation,
 x_5 is realized WPI inflation,
 x_6 unexpected WPI inflation,
 x_7 is net sales of corporations,
 x_8 is the probability that unexpected CPI inflation is higher than unexpected WPI inflation,
 ε is the error term.

CHAPTER V

EMPIRICAL RESULTS

The results of the methodology are discussed in this section. First, the effects of unexpected inflations are investigated separately.

TABLE 2
Effects of Unexpected CPI on Profit Changes

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.53802	0.06241	8.621	<2e-16 ***
e	0.0284	0.05526	0.514	0.607

Signif. level: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 2 shows the effect of unexpected CPI inflation on profit changes formulated in the equation 2.3. It is obvious that unexpected CPI inflation does not affect profit changes alone.

TABLE 3
Effects of Unexpected WPI on Profit Changes

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.71295	0.07354	9.695	<2e-16 ***
h	-0.12775	0.06339	-2.015	0.0442 *

Signif. level: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 3 shows the significant effect of unexpected WPI inflation on profit changes, derived from equation 2.4. Unexpected WPI inflation is significant at 95 percentage level.

TABLE 4
Effects of Difference between Unexpected CPI and Unexpected WPI on Profit Changes

	Estimate	Std. Error	t value	PR (> t)
(Intercept)	0.53623	0.02432	22.052	<2e-16 ***
j	0.06522	0.03439	1.896	0.0582 .

Signif. level: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 4 shows that profit changes are affected significantly in years in which unexpected CPI inflation is higher than unexpected WPI inflation. This is significant at 90 percentage level. First results imply that although unexpected CPI inflation is not significant itself, an increase in the gap between unexpected CPI inflation has significant effect on profit changes.

Another important result is that unexpected WPI inflation could be effective on profit changes.

These results are supported with Chi-square test applied to unexpected CPI and WPI inflations. The difference between expected CPI inflation and realized CPI inflation is divided into two groups. One group includes high difference which means that the difference is higher than one. Other group includes remaining data. Also, profits are categorized as their behavior in high difference periods and low difference periods.

TABLE 5
Profits Categorized According to CPI Differences (including expected counts)

	high CPI difference (>1)	low CPI difference
profit increased	318 (314)	153 (157)
profit decreased	234 (238)	123 (119)

The result shows that chi-square of unexpected CPI inflation is too small to reject the hypothesis that a decrease or increase in profits is independent from the difference between expected CPI inflation and realized CPI inflation. The Chi-square result is 0,354546914. Same application is done for unexpected WPI inflation.

TABLE 6
Profits Categorized According to WPI Difference (including expected counts)

	high WPI difference (1.5> >1)	low WPI difference	very high difference(>1.5)
profit increased	153 (157)	249 (235,5)	69 (78,5)
profit decreased	123 (119)	165 (178,5)	69 (59,5)

However, difference between expected WPI inflation and realized WPI inflation is categorized into three groups. These groups are low difference group which includes data small from one, high difference group which include data between one and one and a half and very high difference group which include data higher than one and a half. The hypothesis is that a decrease or increase in profits is independent from differences between expected WPI inflation and realized WPI inflation. The Chi-square result is 4,6977466146. According to the result, the hypothesis is rejected. Chi-square test of unexpected WPI inflation is significant at 0.10 significance level. These results of chi-square test application support our findings.

Table 6 also shows that changes in profits mainly depend on low WPI difference and very high WPI difference. Under these categories, actual profits deviate from expected profits significantly. Therefore, 1.5 percent deviation from expected profits would hurt corporations. This result is especially important in deciding the implementation style of ‘inflation-targeting’ policy. According to this result, target band or a thick point with

(-+) 1.5 percent range would be the best choice for policy-makers. Either target band or thick point is chosen, it would be better to set a range about 1.5 on both sides. This would reduce the effect of unexpected inflation.

These findings match with some findings in the literature. Gultekin (1983) found out that unexpected inflation had significant and negative effect on ex-post stock returns. Amihud (1996) emphasizes strong negative relationship between stock price and unexpected inflation. Also, Taylor rule emphasized negative effect of deviation from expected inflation rates (1993). According to Taylor rule, deviation from expected inflation results in an increase in nominal short-term interest rate. This, in some ways, could affect the borrowing cost of corporations which eventually leads to a decrease in profit expectations. Schwert (1981) explains that announcement of unexpected inflation negatively affects stock markets, but the magnitude is small.

Starting from equation 2.6., logistic regression model is applied for more than one variable. However, these results do not prove anything because logistic regression model and stepwise regression model could include linearity problem which could result in false implications. Equation 2.6 considers possible effects of expected and unexpected CPI inflations together. As shown in Table 5, both variables are significant. Expected CPI inflation is significant at 99 percentage level, whereas unexpected CPI inflation is significant at 95 percentage level. Also, this result should attract some attention from policymakers who decide CPI inflation as the target inflation in inflation-targeting policy. It carries the importance that

unexpected CPI inflation should be taken into consideration if CPI inflation is the target.

TABLE 7
Effects of Expected and Unexpected CPI Inflations on Profit Changes

	Estimate	Std. Error	T value	Pr(> t)
(Intercept)	-0.04325	0.27032	-0.16	0.8729
c	-0.20505	0.09688	-2.117	0.0343 *
e	0.66026	0.34229	1.929	0.0537 .

Signif. level: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 6, on the other hand, lists the results of the model including expected and unexpected WPI inflations. The results are surprising because none of the independent variables are significant. This may be a reason of multicollinearity problem discussed in the previous section.

TABLE 8
Effects of Expected and Unexpected WPI Inflations on Profit Changes

	Estimate	Std. Error	T value	Pr(> t)
(Intercept)	0.84378	0.3028	2.787	0.00533 **
f	-0.04575	0.04417	-1.036	0.30033
h	-0.39077	0.2885	-1.354	0.17558

Signif. level: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Next equation, equation 2.8, includes expected and unexpected CPI and WPI inflations in the same formula. The results are shown in table 7. According to the table 7, it is obvious that if these variables are taken together, there won't be any significant variable. This may also be a result of multicollinearity problem.

TABLE 9
Effects of Expected and Unexpected CPI and WPI Inflations on Profit Changes

	Estimate	Std. Error	T value	Pr(> t)
(Intercept)	0.624001	0.274232	2.275	0.0231 *
c	0.052295	0.089879	0.582	0.5608
e	0.005432	0.207291	0.026	0.9791
f	-0.04595	0.038529	-1.193	0.2334
h	-0.03266	0.143665	-0.227	0.8202

Signif. level: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Stepwise regression is applied in this equation to find possible relationships between independent variables and dependent variable. It shouldn't be forgotten that by applying stepwise regression it is not aimed to verify any hypothesis. The sole purpose is to find any possible relationship. The stepwise regression drops or adds independent variables according to

the smallest number of Akaike Information Criteria (AIC)⁷. Table 8 shows the results of stepwise regression. These results attract some attention because only expected CPI and WPI inflations become significant. This, of course, is not a strong finding, but a surprising result.

TABLE 10
Revised Set of Table 9 According to Stepwise Regression

	Estimate	Std. Error	T value	Pr(> t)
(Intercept)	0.5923	0.03487	16.986	<2e-16 ***
c	0.06684	0.03973	1.682	0.0929.
f	-0.05597	0.02473	-2.264	0.0238 *

Signif. level: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

What will happen, if all the independent variables used in this research are taken together? The answer is given in table 9. If taken together, none of the independent variables has significant effect. The result also implies that realized inflations –both realized CPI inflation and realized WPI inflation– and net sales of corporations don't have any impact on financial planning of corporations.

⁷ The tables about finding Akaike Information Criteria of equations are put in the Appendix.

TABLE 11
Effects of Independent Factors Together on Profit Changes

	Estimate	Std. Error	T value	Pr(> t)
(Intercept)	-0.32257	3.245648	-0.099	0.921
c	-1.40943	4.845361	-0.291	0.771
d	-0.28543	1.639856	-0.174	0.862
e	1.31569	5.828218	0.226	0.821
f	0.131534	0.839098	0.157	0.875
g	0.880217	3.000233	0.293	0.769
h	NA	NA	NA	NA
log(i + 1)	0.00878	0.006317	1.39	0.165
j	NA	NA	NA	NA

Signif. level: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

After applying AIC step after step only two independent variables left. These independent variables are expected CPI inflation and unexpected CPI inflation. This result matches with the results of equation 2.6. Expected CPI inflation is significant at 95 percentage level and unexpected CPI inflation is significant at 95 percentage level. The only difference from the result of the equation 2.6 is the significance level of unexpected CPI inflation. This result

is good in the sense that expected CPI inflation should not be considered alone. If expected CPI is taken into consideration, unexpected CPI inflation should also be taken to see possible effects.

TABLE 12
Revised Set of Table 11 According to Stepwise Regression

	Estimate	Std. Error	T value	Pr(> t)
(Intercept)	0.308738	0.143015	2.159	0.0312 *
c	-0.05013	0.02384	-2.103	0.0358 *
e	0.178107	0.084517	2.107	0.0354 *
log(i + 1)	0.008989	0.006289	1.429	0.1533

Signif. level: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Some of the tables listed above indicate that expected CPI inflation is a significant variable which has effect on profit changes. However, expected inflation is not significant alone as shown in table 11. Therefore, it is strongly recommended to apply chi-square independence test between profit changes and expected CPI inflation before implementing these results. Since, expected CPI inflation is not focus point of this paper, chi-square test is not done to find this relationship.

TABLE 13
Effects of Expected CPI Inflation on Profit Changes

	Estimate	Std. Error	T value	Pr(> t)
(Intercept)	0.59931	0.03482	17.212	<2e-16 ***
c	-0.01582	0.01571	-1.007	0.314

Signif. level: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The hypothesis set before was that unexpected inflation has effect on profit changes and so, on growth strategies of corporations. Unexpected inflations are decided from two sides. One is the unexpected inflation in Consumer Price Index and second is unexpected inflation on Wholesale Price Index. The results indicate that unexpected Wholesale Price Index inflation has significant effect on profit changes. Since the paper discusses the issue of inflation-targeting policy from the side of corporations, this result is quite meaningful. Any increase in WPI inflation increases costs of production which results in decrease of profits. However, any change in CPI inflation does not directly effect profit changes. Although it is expected that any increase in CPI inflation increases profits, this is not verified in the model used. On the other hand, unexpected CPI inflation becomes significant whenever expected CPI inflation enters into the model. Under this circumstance, both unexpected CPI inflation and expected CPI inflation have significant effect on profit changes. However, this result should be investigated further because the methodology used may include

multicollinearity problem which could cause false conclusions. Another result which supports the hypothesis is that unexpected inflations have significant effect on financial planning is the effect of difference between unexpected CPI inflation and unexpected WPI inflation on profit changes. The results indicate that profits of corporations increase in the years in which unexpected CPI inflation is higher than unexpected WPI inflation and decrease in the years in which unexpected WPI inflation is higher than unexpected CPI inflation.

CHAPTER VI

CONCLUSION

This paper investigated that unexpected inflation was a significant factor in growth strategies of corporations. Depending on the paper of Erdogan, Berk and Katircioglu (2000), inflation is put into the profit maximization model to show the effects of periods. If it would be sure that there won't be any deviation from expected inflation rates, then there won't be any need to add unexpected inflation into the calculation. However, this seems very difficult. Therefore, the effects of unexpected CPI and WPI inflations on profit changes were derived separately. These derivations suggested a positive relationship between unexpected CPI inflation and profit changes and a negative relationship between unexpected WPI inflation and profit changes. Logically, an increase in unexpected CPI inflation leads to an increase in prices of goods sold which leads to increase in profits. On the other hand, an increase in unexpected WPI inflation leads to an increase in cost of goods sold which decreases profits of corporations.

Empirical research was done to show whether such deviations had really impact on profit changes. Therefore, an application was conducted on 136 Turkish corporations which issued stocks in ISE. Data taken were profits of these corporations between 1998 and 2004. Also, expected inflation rates were taken from SIS real producer survey. By using logistic regression

model, relationships between unexpected inflations and profit changes between years were investigated. The results implied a significant relationship between unexpected WPI inflation and profit changes, at 99 percentage level. However, the relationship between unexpected CPI inflation and profit changes could not be verified in the research. The results of chi-square test supported these findings. The results of chi-square test reflected that profit changes were independent from unexpected CPI inflation, whereas they were dependent on unexpected WPI inflation (the significance level is 0.10). Another result found by logistic regression method is that profit changes are affected significantly with the situation that unexpected CPI inflation is higher than unexpected WPI inflation.

The results of this paper strengthen the view that unexpected inflation is an important matter which should be taken into consideration. The danger of unexpected inflation is also discussed by Gultekin (1983), Schwert (1981), Titman and Warga (1989), and Amihud (1996). Especially, Gultekin (1983), Schwert (1981) and Amihud (1996) discussed the negative effect of unexpected inflation on growth strategies.

There are some further research topics dealing with this paper. For example, the profits were taken from financial statements corporations publicized. It would be better to repeat the research with profits which are gotten after financial statements are reviewed according to international accounting standards. This, of course, is another research topic which may attract some attention. Also, it would be another research topic to discuss the amount of risk created by deviation from expected inflation rates. This

paper investigated the significant effect of unexpected inflation, but it did not deal with the risk corporations face with. Therefore, calculation of the risk will be beneficial for corporations in making their growth strategies.

As a conclusion, this paper shed light on dangers of unexpected inflation. It was shown that unexpected inflations, both unexpected WPI inflation and unexpected CPI inflation, give harms to financial plans of corporations. Emergence of unexpected inflations hinders corporations to reach their targets. As explained earlier, inflation-targeting policy requires public support. Moreover, the role of the producers in 'inflation-targeting' policy is crucial because they are the productive power of a country. Under a circumstance, like an increase in unexpected WPI inflation, corporations can not follow the requirements of inflation-targeting policy. This means that corporations can not maintain their support for this policy. If corporations withdraw their support, it will lead to the failure of inflation-targeting policy. Results of such a failure could be very harmful for whole country.

APPENDIX

Stepwise regression of the equation 2.8.

AIC= 1135.81

$b \sim c + e + f + h$

TABLE 14
Stepwise Regression Table of Equation 2.8.

	Df	Deviance	AIC
e	1	1125.8	1133.8
h	1	1125.9	1133.9
c	1	1126.2	1134.2
f	1	1127.3	1135.3
<none>		1125.8	1135.8

1. Step: AIC= 1133.81

$b \sim c + f + h$

TABLE 15
Stepwise Regression Table of Equation 2.8. Step 1

	Df	Deviance	AIC
h	1	1125.9	1131.9
c	1	1127	1133
f	1	1127.6	1133.6
<none>		1125.8	1133.8

2. Step: AIC= 1131.94

$b \sim c + f$

TABLE 16
Stepwise Regression Table of Equation 2.8. Step 2

	Df	Deviance	AIC
<none>		1125.9	1131.9
c	1	1128.8	1132.8
f	1	1131.1	1135.1

Stepwise regression of the equation 2.9.

AIC= 1193.73

$b \sim c + d + e + f + g + h + \log(i + 1) + j$

1. Step: AIC= 1193.73

$b \sim c + d + e + f + g + h + \log(i + 1)$

2. Step: AIC= 1193.73

$b \sim c + d + e + f + g + \log(i + 1)$

TABLE 17
Stepwise Regression Table of Equation 2.9. Step 2

	Df	Deviance	AIC
f	1	201.05	1191.75
d	1	201.05	1191.76
e	1	201.05	1191.78
c	1	201.06	1191.81
g	1	201.06	1191.81
log(i+1)	1	201.51	1193.67
<none>		201.04	1193.73

3. Step: AIC= 1191.75

$b \sim c + d + e + g + \log(i + 1)$

TABLE 18
Stepwise Regression Table of Equation 2.9. Step 3

	Df	Deviance	AIC
d	1	201.05	1189.78
c	1	201.11	1190.02
g	1	201.12	1190.06
Log(i+ 1)	1	201.52	1191.72
<none>		201.05	1191.75
e	1	201.98	1193.59

4. Step: AIC= 1189.78

$b \sim c + e + g + \log(i + 1)$

TABLE 19
Stepwise Regression Table of Equation 2.9. Step 4

	Df	Deviance	AIC
g	1	201.41	1189.23
c	1	201.45	1189.41
<none>		201.05	1189.78
log(i + 1)	1	201.54	1189.79
e	1	201.99	1191.64

5. Step: AIC= 1189.23

$b \sim c + e + \log(i + 1)$

TABLE 20
Stepwise Regression Table of Equation 2.9. Step 5

	Df	Deviance	AIC
<none>		201.41	1189.23
log(i + 1)	1	201.91	1189.28
c	1	202.49	1191.67
e	1	202.49	1191.68

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