T.C.
MARMARA ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ
İKTİSAT ANABİLİM DALI
İKTİSAT (İNG) BİLİM DALI

UNCERTAINTY AND INVESTMENT: EVIDENCE FROM THE PANEL DATA OF TURKISH MANUFACTURING FIRMS

Yüksek Lisans Tezi

Gülden KARAPINAR

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Danışman: Prof. Dr. A. Suut DOĞRUEL

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Marmara Üniversitesi
Sosyal Bilimler Enstitüsü Müdürlüğü

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3) Jüri Üyesi :	**DOÇ. DR. MURAT DONDURAN**	.....

To my parents Duran and Salime KARAPINAR …

ABSTRACT

UNCERTAINTY AND INVESTMENT: EVIDENCE FROM THE PANEL DATA OF TURKISH MANUFACTURING FIRMS

KARAPINAR, Gülden

M.A., Department of Economics

Thesis Supervisor: Prof. Dr. A. Suut DOĞRUEL

August, 2008

The aim of this study is to investigate whether investment decision of the Turkish firms operating in Manufacturing industry is sensitive to the uncertainty or not. The study is performed using panel data of Turkish Manufacturing Firms listed in Istanbul Stock Exchange for the period of 1993-2002. GARCH modeling, standard deviation of unpredictable part of stochastic variable and the normal standard deviation of variable are the methods to be employed in the construction of uncertainty proxy. In addition, to explore the sensitivity of reaction of investors to the different source of uncertainty, three variables are utilized. Real effective exchange rate index is used to construct economy wide uncertainty proxy. Real wage index of each industry and net sales of firms are chosen as representative of industry wide uncertainty and firm specific uncertainty, respectively. According to the panel data estimations results, economy wide uncertainty affects investment positively while industry wide and firm specific uncertainty affect negatively.

Key Words: Uncertainty, Investment

ÖZET

BELİRSİZLİK VE YATIRIM: TÜRK İMALAT SANAYİ FİRMALARI PANEL DATA ÖRNEĞİ

KARAPINAR, Gülden

Yüksek Lisans, İktisat Bölümü

Tez Danışmanı: Prof. Dr. A. Suut DOĞRUEL

Ağustos, 2008

Bu çalışmanın amacı imalat sanayinde faaliyet gösteren Türk firmaların yatırım kararlarının belirsizliğe duyarlı olup olmadığını incelemektir. Çalışma İstanbul Menkul Kıymetler borsasında hisseleri işlem gören imalat sanayi firmalarının 1993-2002 yılları arasındaki panel verileri kullanılarak yapılmıştır. Belirsizlik GARCH Modelleme ile koşullu standart sapma, AR modelleme ile rassal değişkenin tahmin edilemeyen kısmının standart sapması ve normal standart sapma formülü ile verinin standart sapması bulunarak ölçülmüştür. Bunun dışında, yatırımcı tepkilerinin farklı belirsizlik kaynaklarına duyarlılığını araştırmak için üç farklı değişkenden yararlanılmıştır. Tüm ekonomide geçerli olan bir belirsizlik ölçüsü oluşturmak için reel efektif döviz kuru kullanılmıştır. Endüstride geçerli olan belirsizlik ölçüsü her sektörün reel ücret indeksi kullanılarak ve firma için geçerli olan belirsizlik ölçüsü her firmanın net satışları kullanılarak oluşturulmuştur. Panel veri tahmini sonuçlarına göre, döviz kuru belirsizliğinin yatırımları pozitif etkilediği, endüstri spesifik reel ücret belirsizliğinin ve firmaların kendi satışlarından kaynaklanan belirsizliğin yatırımları negatif etkilediği bulunmuştur.

Anahtar Kelimeler: Belirsizlik, Yatırım

PREFACE

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İstanbul, 2008 Gülden KARAPINAR

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LIST OF ABBREVIATIONS

AER : Exchange rate uncertainty proxy obtained from AR(1,3) model of real effective exchange rate index.

AW : Wage uncertainty proxy obtained from AR(1) model of real wage indices of each industry

DER : Differenced real effective exchange rate index

ER : Real effective exchange rate index

GER : Exchange rate uncertainty proxy obtained from AR(1,3)-GARCH(1,1) model of real effective exchange rate index

GW : Real wage uncertainty proxy obtained from GARCH models of real wage indices of each industry

I : Ratio of gross investment to the previous year capital stock (I/K_{t-1})

NP : Ratio of net profits to the previous year capital stock (NP/ K_{t-1})

NS : Ratio of net sales to the previous year capital stock (NS/K_{t-1})

SER : Exchange rate uncertainty proxy obtained from normal standard deviation formula

SNS : Firm specific uncertainty proxy computed with normal standard deviation formula of firms net sales.

SW : Real wage uncertainty proxy computed with normal formula of standard deviations of real wage indices of each industry.

CHAPTER1. INTRODUCTION

Since investment is one of the most important determinants of aggregate demand and growth capacity of an economy, studying the fundamental principles of investment spending has always drawn attention among economists. Despite huge efforts, clear and convincing results about which factors influence the investment spending of investors has not been illuminated yet. Researchers trying to examine the potential reasons why models failed to reach convincing results stress on the fact that different assumptions made in the models create these distinct results.

In general perspective, economics define investment as a current commitment of cost to obtain future benefits (Luenberger, 1998:1). Although all investment models accept the same investment definition, the discrepancy stems from that earlier investment models investigate the determinants in certain environment and suggest that investment spending depends on variety of factors such as interest rate, liquidity, user cost of capital, saving, sales, and tax rate while recent models of investment focus on the importance of the stochastic environment and recommend that uncertainty may affect investment decision more than other factors. The differences between stochastic and deterministic models come from the fact that earlier theorists accept that all future events can be known or predicted in advance to create certain environment for the theory. However, receiving all future events can be known creates a perfect world in which knowledge is useless and uncertainty do not emerge at all and thus, cannot be used as a determinant of investment decision. (Hoppe, 1997)

Stochastic models accept that investors generally have certain information for present event; however, they cannot have perfect information about future events and cannot predict future perfectly, as stressed by Hirshleifer (1965). This fact makes future and hence future benefits obtained from current investment spending uncertain. Since nobody has perfect information about future events, expectations of future events become a significant factor in investment decision process. For this reason, it has been suggested that investors' perception of uncertainty can be taken as a significant factor in determination of investment spending in addition to the earlier theories' determinants.

After admitting possibility of the effects of uncertainty over investment decision, researchers strive to explain how uncertainty affects investment spending decision. Nevertheless, they have not found precise way and precise sign to identify this relation. On the one hand, researchers declare the negative and/or linear relation in both theoretical and empirical studies. On the other hand, positive or/and nonlinear relation is announced. It has been admitted that the existent ambiguity on the sign of uncertainty-investment relation arises from different assumptions and parameters underlying in the models as mentioned above.

The objective of this dissertation is to examine empirically whether Turkish manufacturing firms' investment decision is sensitive to the uncertainty or not and to explore how different sources of uncertainties affect investment decisions. For this reason, study is organized as follows. In Chapter2, both theoretical and empirical studies about investment- uncertainty relation are reviewed. In the following chapter, the data derived from balance and income sheets are described. In addition, the methods

to construct uncertainty proxies are discussed. The specification of investment function and the results of the panel data estimations are presented in Chapter 4. Chapter5 summarizes the findings of the study.

CHAPTER2. UNCERTAINTY IN INVESTMENT MODEL

Since researchers issued ambiguous results on the relationship between uncertainty and investment, they questioned which reason could be given as a source of these different results. In this process, researchers realized that different assumptions underlying in the models created these alternative results. Because there are lots of works investigating uncertainty and investment focusing on different assumptions, it would be useful categorizing studies based on the same assumptions. Lensink and Bo (2005) collected important factors defended by different researchers and emphasized that some of them created positive results whereas some of them created negative results. They summarized that the different assumptions over the risk attitude of the firm, the degree of irreversibility, the option value of investment opportunities, the competitiveness in product markets and the production technology, and the degree of financial constraints are the main assumptions bringing about such turmoil. In this study for the examination of the uncertainty-investment relation, studies are grouped under the same titles as in Lensink and Bo (2005). Additionally, since three different uncertainty proxies are applied, studies considering economy wide, industry wide and firm specific uncertainty are examined to explore how these uncertainties affect investment spending. The studies investigating the effects of uncertainty are summarized below.

2.1-IRREVERSIBILITY AND THE OPTION VALUE

Researchers recently have recognized the fact that, in addition to the uncertainty assumption, most investors take into account two other important characteristics of the investment spending which is not mentioned in earlier theory. These three characteristics of investment spending influence each other and affect the investors' decisions significantly. Especially, researchers have intensified on the effects of interaction of these three important characteristics (Dixit and Pindyck, 1994:3). First characteristic is that investment expenditures are mostly irreversible. That is, even if an investor changes his mind to revise the investment decision, if it is conducted, he cannot give up the ongoing investment project immediately. If investor decides to give up, because disinvestment is costly, he has to bear a cost which is called as sunk cost.

Second, as mentioned before, investment decision depends on the future benefits, and the future benefits are mostly uncertain. Investors cannot calculate the exact benefits, in some cases unexpected bad conditions may erase (increase) the expected profits and adds new cost (benefits) to the investors. Hence, uncertainty leads the firms to rethink the option of a project considering future possibilities. Third characteristic is that time of an investment decision can be rearranged. In other words, an investor can postpone or delay the investment decision to obtain more information about the uncertain market conditions and to hold future investment opportunity alive. Firm can assess the projects by waiting new information about prices, costs or market conditions. Hence, investors can improve the investment project. With these three features of investment decision (irreversibility, uncertainty, ability to delay) investors must decide which project to choose and which point in time is best for performing the

chosen project (Dixit and Pindyck, 1994).

The criticism of the researchers taking the three features of investment spending into account is that earlier researchers do not consider the interaction of these features and they build a framework for investment decision assuming either reversible investment or irreversible investment based on now and never structure to exclude possibility of waiting (Dixit and Pindyck, 1994:6). In earlier perspective, the question about when and how a firm decides to implement an investment project are answered by comparing the present value of the expected stream of profits from this investment and the present value of the stream of expenditures required to finish this investment project. The difference between these present values is called net present value (NPV). According to this framework, investment can be undertaken when the value of the unit capital is at least equal to its purchase and installation cost.

Dixit and Pindyck (1994) and the followers emphasize that the oversight of the three characteristics of investment decision induces the problem in the calculation of net present value of an investment project because this interaction expose some significant outcomes. According to them, NPV rule must be rearranged considering the outcomes of three characteristics of investment. An important outcome is that this interaction creates an option, which is similar to the financial call option, and this option gives the right to investors to implement an investment decision at some time in future. Because of irreversible nature of the investment spending, exercising this option means losing the possibility of waiting in order to revise investment decision when market condition changes adversely. For this reason, investing now has an opportunity cost. By virtue of this claim, researchers in this area claim that NPV rule must add this opportunity cost

into calculation. According to them, investment is suggested to be fulfilled when the value of the project is higher than its purchase and installation cost by an amount to keep the investment option alive which is equal to the opportunity cost. That is, when value of a project is higher or at least equal to the threshold value of this project, investment should be undertaken; otherwise waiting for new information should be evaluated. Besides this option, another important outcome of this interaction is that value of the option can be too sensitive to uncertainty. Even though the effects of irreversibility and timing are excluded in standard NPV, uncertainty concept is added into the calculation of both Standard NPV and NPV mentioned here. In standard NPV, uncertainty affects the risk premium and so the discount rate used in the computation. Nevertheless, under irreversibility and timing assumption, uncertainty brings about more and fundamental outcomes than Standard NPV and so excluding the presence of uncertainty creates much more mistakes in the latter case.

The fact that irreversibility affects investment decision creating an option to wait new information for reevaluation of investment decision, the question about what makes investment spending irreversible is important in order to interpret the results of the studies. Pindyck (1990) lines up the potential reasons why resale price of capital is below than its acquisition price. He indicates that irreversibility arises when the capital is industry specific or firm specific. This leads that these capital goods cannot be used in different industries or in different firms. So, their resale prices will be below their purchase prices. In addition, even if investment is not firm or industry specific, because of the lemon problem, market prices of the machines will be below of their purchase prices. Another reason can arise due to government regulations or institutional arrangements.

After irreversibility is introduced, the effects of irreversibility over investment decision under the assumption of uncertainty have been explored growingly in the literature. The study of McDonald and Siegel (1986) can be taken as first study examining the optimal timing of investment in an irreversible project under the case future benefits are stochastic. They find that option value can be large, so that waiting may be more logical behavior than investing until benefits of investment are higher than its cost. Pindyck (1986) studies a model of capacity choice assuming that investment is irreversible and future demand is uncertain and reaches to the conclusion that value of a marginal unit of capacity to be at least as large as its full cost. In this line, Dixit and Pindyck (1994:152) investigate the consequences of irreversibility and waiting in investment-uncertainty model. Since irreversibility can be taken as a cost, this cost can be added to the adjustment costs. The addition of irreversibility to the adjustment cost function makes the adjustment cost function to be asymmetric. According to them, asymmetric adjustment cost leads to the statement that investment is solely undertaken when the difference between present value of project and cost of capital is higher than the threshold value. They demonstrate that an increment in uncertainty increases this threshold value and decrease investment. In this view, because waiting is encouraged, an increase in uncertainty diminishes investment spending.

Later researches changed the nature of the some assumptions in the solution of irreversible investment problems in the case of uncertainty and then investigated the same question. For example, Abel and Eberly (1994) utilized the irreversibility and adjustment cost function in their model explicitly. They assumed that investment cannot be negative. Moreover, they offered augmented adjustment cost function, which consists of traditional convex adjustment cost, fixed costs and irreversibility. Investment

is assumed as a non-decreasing function of q_t and three regimes are admitted as optimal for investment. In other study, Abel, Dixit, Eberly and Pindyck (1996) accept that firm can induce disinvestment. That is, this model does not assume complete irreversibility; it defends that some investment decisions can be reversed at different degrees. Admitting disinvestment is particularly important because earlier option pricing models, due to complete irreversibility assumption, examine firm solely has a call option and exclude the outcomes when firms have a put option. However, by introducing disinvestment, put option's outcomes can be examined. According to the study, an increment in uncertainty leads two opposite results. On the one hand, growing uncertainty increases the value of the put option which encourages investment spending. On the other hand, growing uncertainty increases the value of the call option which discourages investment spending. Dixit and Pindyck (1998) also investigate for continuous time model of capacity choice considering limited reversibility and expandability which create put option and call option and so drive the result in opposite direction. Moreover, Abel and Eberly (1999) indicate that the sign of this relationship can be positive. They divide the effects of uncertainty on irreversible investment as user cost effect and hangover effect. User cost effect exists because of the fact that uncertainty increases option value and threshold which increase user cost of capital. Due to increasing user cost of capital, investors do not want to invest today. However, hangover effect emerges in some situations where reselling capital can be impossible and firms cannot disinvest and in the long run, investment increases. Although an increment in uncertainty increases the user cost of capital which leads the negative effects of uncertainty on irreversible investment, hang over effect leads the accumulation of capital. Since, these two affects move in opposite directions at the same time, the net effects of uncertainty become ambiguous.

As for empirical research in this line, Guiso and Parigi (1999) point out for Italian manufacturing firms that the magnitude of negative relationship between uncertainty and investment is higher for firms which cannot reverse investment decision immediately. Nevertheless, Bar- Ilan and Strange (1999) indicate the probability to find the positive relationship between uncertainty and irreversible investment. Ninh, Hermes and Lanjouw (2004) investigate the effects of uncertainty on irreversible investment using firm level data based on the survey among 210 rice mills firms in the Mekong River Delta in Vietnam and accept the future growth rate of sales as uncertainty proxy. They conclude that investment is influenced by uncertainty in the case of irreversibility. However, they postulate that the degree of the negative relation is not related with the degree of irreversibility. Bo (2006) examines whether hang over effect is valid for the Dutch firms bearing on the assumption that capital stock is adjusted longer time than inventory stock and find that firms reduce inventory stocks by larger amount than capital stock. It is accepted as an evidence of hang over effect among Dutch firms.

2.2 -THE COMPETITIVENESS IN PRODUCT MARKETS IN COMBINATION WITH THE PRODUCTION TECHNOLOGY

Abel (1983) constructs a continuous time model for a risk-neutral competitive firm which faces convex adjustment cost to investigate the impact of the output price uncertainty on investment spending. He detects that optimal rate of investment is an increasing function of $q_{t,}$ which is equal to the present value of the expected marginal revenue of product, and this fact leads investment to be independent from capital stock. According to the result of this study, since marginal revenue product of capital is a

convex function of output prices, an increment in uncertainty of the future output prices increases q_t and consequently increases the optimal rate of investment. Abel (1985) extends the framework of this model and adds two types of uncertainties, the one is mean preserving spread and the other is an increase in scale. Mean preserving spread leads increases in investment while an increase in scale creates ambiguous results.

The positive result is also found in Caballero (1991). Caballero (1991) points out that negative results generally found in irreversible investment studies do not mean that irreversibility decreases the investment. That is, irreversibility per se is not sufficient to rely on a negative relationship between investment and uncertainty. He claims discrepancy between these two literatures do not stem from the different assumptions about the adjustment cost function. The more important reason to explain negative results is that irreversible investment literature assumes imperfect competition and/or decreasing returns to scale while the other assumes perfect competition and constant returns to scale. Caballero builds a model considering both symmetric and asymmetric adjustment cost mechanism to indicate the unimportant role of the type of the adjustment cost function, and to emphasize important role of the decreasing marginal return to capital assumption which can be constructed by assuming imperfect competition or/ and decreasing returns to scale. He postulates that after firms are assumed to be competitive, positive relation is found regardless how adjustment cost is introduced into the model. However, accepting these results does not imply the fact that adjustment cost does not affect the investment decision at all. In fact, different adjustment cost is helpful in determining the dynamics of investment and business cycle implications. (Caballero, 1991)

However, Pindyck (1993) criticizes Caballero's result due to taking only into account firm specific uncertainty, and he indicates that relation between uncertainty and irreversibility in competitive markets solely takes place under the assumptions of industry wide uncertainty. By examining industry wide uncertainty, even if perfect competition and constant returns to scale is assumed, Pindyck (1993) reaches negative relation between industry-wide uncertainty and irreversible investment as opposite of Caballero (1991). In the same extend, Caballero and Pindyck (1996) investigate the effects of both industry wide uncertainty and idiosyncratic uncertainty on price level, entry decision and irreversible investment decision in the competitive industry. According to them, idiosyncratic uncertainty solely influences the individual firm and do not bring about any entry toward industry. Nevertheless, industry wide uncertainty affects irreversible investment in two ways; capacity expansion in industry and distribution of prices arising from entry of new firms. Positive aggregate shock sourced from demand increases leads new entry to the industry until market became clear which reduces the increment of prices. However, they point out that in the case of negative aggregate shocks sourced from demand decreases which cause a decrease in prices, firm cannot exit industry without bearing cost because of the irreversibility and this decrease in prices cannot be readjusted to make market clear as in positive shock case. Hence, as a result of negative shocks, threshold rises. Thus, they conclude that a negative shock leads a decrease in investment decision more than an increase generated by positive shocks.

2.3-THE DEGREE OF FINANCIAL CONSTRAINTS

The earlier theories of investment exclude financial constraints in the examination of firms' investment decision by virtue of Modigliani and Miller (1958) proposition in which they claimed that under certain conditions financial structure has not influenced real investment decision. After this proposition, researches based on this line assume perfect capital market where external funds of firms are perfect substitute for internal funds. However, under the case of imperfect capital markets, some researchers indicate that investment is affected by the financial constraints such as internal or external finance. In this line, internal finance is admitted less costly than external finance. Fazzari, Hubbard, Peterson, Blinder, Poterba (1988) line up the potential reasons of expensive external finance such as transaction cost, tax advantages, agency problem, cost of financial distress and asymmetric information.

Jorgenson and Siebert (1968), Bischoff, Bosworth and Hall (1971) collect the empirical works investigating the relationship between financial constraints and investment in a deterministic framework and compare with other theoretical investment functions, and they show that financial factors affect investment spending. Fazzari et al.(1988) emphasizing asymmetric information among manager, new investors and creditors and taking firm size into account by virtue of dividend payout ratio, postulate that financial factors impress investment behavior of US firms, and has larger impact on investment for low-dividend firms than for high-dividend firms. However, Kaplan and Zingales (1997) point out that the less constrained firms indicate higher cash flow sensitivity of investment as opposite of Fazzari et al. (1988). Pawlina and Renneboog

(2005) find also strong implications between cash flow sensitivity and investment spending. Furthermore, they try to analyze which source of this relation is more prominent; agency problems or asymmetric information. They deduce that cash flow sensitivity arise mainly from agency problems in UK firms. Dividing all samples regarding ownership concentration of the shareholders, they posit that magnitude of this relation also depends upon insider ownership. According to this study, outside block-holders reduce this sensitivity due to the fact that they can control the firm and hence this reduction decreases asymmetric information.

In stochastic researches, investigators generally assume perfect capital markets in which external and internal finance is perfect substitute. Therefore, they generally do not focus on financial constraints. However, this does not mean that there is no study about this discussion. Carruth, Dickerson and Henley (2000) investigate separately the effects of profit and uncertainty on investment decision for industrial and commercial UK's companies and find that profits significantly explain the aggregate investment both in the short and long run. Ghosal and Loungani (2000) examine uncertainty sourced from firm's profits and state that profit uncertainty mitigates investment spending. Additionally, they emphasize that negative impact of uncertainty on investment is much greater for industries consisting of small firms than industries consisting of larger firms. Boyle and Guthrie (2003) claim that investment-cash flow relation should be modeled in a dynamic context as well as static context. They put financial constraint into the McDonald and Siegel (1986) irreversible investment model and they suggest that investment is undertaken as soon as NPV of a project is higher than threshold value. In this view, due to the fact that both value of the project and optimal policy is affected by financial constraints, investment spending is provoked by

future financial constraints which lead to exercise the waiting option before its proper time, especially for small firms. As for uncertainty over firms' cash flows, greater uncertainty increases future risk thereby decreasing the value of the waiting and increasing current investment. If a firm is financially unconstrained and has high cash flow, risk of postpone will be small. On the contrary, if a firm has low cash flow, the risk of postpone will be greater. Thus, they defend that any additions of cash have little positive effects on high cash flow firms.

2.4- THE RISK ATTITUDE OF THE FIRM

In many uncertainty researches, the investors are generally assumed to be risk neutral. However, by constructing alternative investors' behaviors, researchers reach different results. Sandmo (1970) and (1971) investigates the impact of uncertainty over saving decision and competitive firm behavior respectively under the risk aversion assumption and he finds that absolute risk aversion and relative risk aversion is important for the result of uncertainty. Hartman (1976) reaches ambiguous result in CES type production function under the assumption that capital is assumed as quasi fixed factor which leads capital to be determined before observed price and labor is assumed to be variable factor which leads labor not to be determined before observed price. With these assumptions, output level is not emerged until its price is known. Nevertheless, he indicates that after using constant returns to scale production function, increasing uncertainty induces greater capital stock. Femminis (2006) postulates that price uncertainty depresses investment for the risk-averse competitive firm that can borrow outside resources at the riskless rate and can optimally changes decision about its leverage rate. The reason of the negative results arises from the fact that any

increments on uncertainty lead a decrease in returns of internal finance tools and also lead owners to diminish short position in the external finance tool at the same time. Thus, these two effects mitigate investment spending.

Nakamura (1999) constructs a model in which he assumes risk-averse competitive firm and indicates negative relation between uncertainty and investment at any time when the risk aversion parameter is higher than the elasticity of output with respect to labor but less than one. Saltari and Ticchi (2005) criticize Nakamura's results because of using inappropriate value function. However, after adjusting the solution of Nakamura (1999), they reach the same result with him. They find that under the assumption that capital depreciation rate is equal to unity, uncertainty affects investment positively except for the case that parameter of risk averse is higher than labor flexibility coefficient but less than one. In fact, they demonstrate that investment decision is affected by two ways. On the one hand, in flexibility effect in which labor is flexible factor relative to the capital, any price shocks lead substitution between these factors and hence, expected marginal revenue product of capital increases which leads an increase in investment spending. On the other hand, due to the risk aversion effects, which decreases investment spending, investor does not take into account expected return to capital but the correspondent certainty equivalent. The certain result of these effects on investment decision depends on which effect is dominant. If magnitude of risk aversion parameter is greater than labor flexibility parameter, then risk aversion effects prevail. Otherwise, flexibility effects prevail. In fact, prevailing effects depend on the substitution and income effects, that is, the magnitude of elasticity of intertemporal substitution. If risk aversion parameter is equal to unity, both income and substitution effects compensate each other and no effect emerges. Femminis (2008)

stresses the fact that because risk aversion parameter is found in many studies as higher than one, negative result found in Saltari and Ticchi (2005) under the case for risk aversion parameter is greater than labor flexibility but less than one cannot be generalized. Femminis (2008) puts forward that this results come from the fact that capital depreciation rate assumed to be equal to one. He posits that even if risk aversion parameter is equal to unity, negative relation can be found assuming acceptable capital depreciation rate. When depreciation rate is small, risk aversion effect will be small. In further examination, Saltari and Ticchi (2007) examine the effects of capital depreciation rate assuming to be lower than one, and reach threshold value for the risk aversion parameter. If risk aversion coefficient is less than the threshold value, an increase in uncertainty increases the certainty equivalent of return to capital or vice versa. They restate that relation between uncertainty and investment cannot be explained bearing only risk aversion. Intertemporal substitution effect is more significant in the explanation of this relation.

Empirically, Aizenman and Marion (1999) point out the negative correlation between private investment and uncertainty in developing countries. Bo and Sterken (2007) explicitly introduce risk premium data and find for Dutch firms that small risk aversion coefficient induces positive impact of demand uncertainty on investment. Furthermore, they postulate that risk averse firms cut investment on account of demand uncertainty, whereas risk taker firms increase.

2.5- SOME SELECTED STUDIES EXAMINING ECONOMY WIDE, INDUSTRY WIDE AND FIRM SPECIFIC UNCERTAINTY

In this part, some studies are grouped considering their uncertainty proxies in the model. First group of this part investigates the studies considering economy wide uncertainty. Because there is a substantial body of works using different types of proxy as representative of economy wide uncertainty such as inflation rate, exchange rate, real interest rate, the ratio of budget deficit to the GDP. Because exchange rate uncertainty is used in this study, solely the models examining the effects of exchange rate uncertainty are summarized. Besides, the studies examining the effects of industry wide and firm specific uncertainty are explained.

Goldberg (1993) claims that exchange rate uncertainty has an influence on the investment decision thereby influencing profitability of a sector, wealth level of individuals, and location of production facilities. According to her, exchange rate uncertainty affects sector-specific profitability via changing demand and supply of a sector. These effects move oppositely and lead ambiguous results in investment studies. Sector-specific profitability is also affected because of the effects of uncertainty over expected cost of production and expected revenues from international sales. In this case, the sign is affected by factors such as risk aversion, irreversibility and others mentioned in literature survey. For instance, in accordance with irreversible investment and convex profit function assumptions, real exchange rate uncertainty increases exports and hence profits of firms producing traded good. As for firms producing non-traded goods, profits can be affected positively or negatively or even not. However, if producer is accepted to be as risk averse, concave utility function may be more effective

than convex production function. Hence this leads ambiguous results. In addition to the effects of exchange rate volatility over sector-specific profitability, uncertainty induces entry to a sector or exit from a sector and hence the relocation of production facilities. Wealth effect may also significantly affect investment decision depending upon the preferences of individuals. (Goldberg, 1993) Another effect arises from the balance sheet effects. Balance sheet effect means that firm's debt is denominated in foreign currency while firm's income is denominated in domestic currency. A large depreciation decreases the firm's net value. Firm risk increases and credit becomes more expensive and restrictive. Balance sheet effect, therefore, decreases investment spending.

Erdal (2001) examines the impacts of exchange rate uncertainty over irreversible investment spending in theoretical context. She finds that because real exchange rate uncertainty brings about an increment in threshold values and increases inaction zone, investment spending diminishes in all type of firms regardless of being export oriented, import competing and import oriented.

Nevertheless, Darby, Hallett, Ireland and Piscitelli (1999) mention in the presence of the threshold effects, increasing uncertainty may increase or decrease irreversible investment. They state that despite increasing uncertainty increases the inactivity zone, it does not affect the upper level of prices. While volatility is increasing, the conditions creating positive or negative effects over investment decision depends on the scraping value of investment and opportunity cost of waiting. When opportunity cost of waiting is higher than private sector' discount rate or riskless rate of return, inactivity zone increases and thus investment decreases. In the case of low

scraping price, an increase in volatility run investment up because an increment in volatility decreases the probability of conducting useless investment. In the case of low opportunity cost of waiting with high scraping price, waiting is provoked rather than investing. However, with high opportunity cost of waiting, investment is more preferable than waiting even in the case of high scraping price. This hypothesis is tested for France, Germany, Italy, UK and US in empirical examination. It is found that long run effect is effective for US, German and France. Temporary effects influence only UK and Italy. But both short and long run impacts are found to be negative. Hallett, Peersman, Piscitelli (2004) investigate the sign of this relation for industries but cannot reach clear cut sign. They state that the industries where scrap costs are low, exchange rate uncertainty increases investment. The industries with high opportunity cost of waiting and high scrapping costs, an increment in exchange rate uncertainty also increases investment. In the case of low waiting cost, exchange rate uncertainty leads negative effect.

Goldberg (1993) investigates empirically the exchange rate uncertainty and investment for US' industries and reaches that although not having significant relation between exchange rate uncertainty and investment in all sample period, in sub-periods, manufacturing durables and nonmanufacturing sectors is influenced significantly. She concludes that exchange rate depreciation leads contractions in investment spending and exchange rate appreciation leads expansion in investment spending in 1980s while this relation is not satisfied in 1970s. Byrne and Davis (2003) in empirical analysis investigate which results for major industrial countries emerge. They use alternative GARCH models to clarify whether the permanent or transitory effects of volatility and whether negative or positive standpoint of volatility is significant on investment

decision. For EU4, they postulate that transitory shocks affect investment significantly while permanent shocks do not. In the examination of asymmetric shocks, they show that Japan, Germany and Canada are influenced significantly. Sérven (2002) also investigates this relation among developing countries and issues negative relations. In addition, he gives evidences for threshold effects which mean higher level of uncertainty leads higher impact and he adds that negative effects are greater for highly open countries and less developed financial system. For Brazilian economy, Pereira (2001) declares negative results for relation between volatility of interest rate, price of capital good, exchange rate and investment.

The uncertainty may only arise in specific industry due to special reasons, so it is expected to affect firms in this industry directly and related industries' firms indirectly. Uncertainty in an industry may change investment spending by influencing entry decision to industry and exit decision from this industry depending upon the irreversibility degree, competitiveness and some other factors as mentioned before. There are some efforts to explain the channels of this effect and to find the sign of the relation between industry wide uncertainty and investment both theoretically and empirically. In empirical study, Ogawa and Suziki (2000) investigate the effects of industry wide uncertainty using standard deviation of production index of industries as a proxy and show this kind of uncertainty impacts investment negatively. Pattillo (1998) reports that Ghanian manufacturing firms are affected by uncertainty calculated using survey data about entrepreneur's perception of future demand of firms' product. Results found in his study posit that firms prefer to wait until arriving at the hurdle level and greater uncertainty mitigates firm's investment spending. Sile (2003) investigates industry wide uncertainty for 16 Turkish manufacturing sectors. As a proxy she chooses

output price and labor productivity index as a proxy of demand and supply uncertainty, respectively. She reaches that although demand uncertainty affects investment negatively, the effect of supply uncertainty depends on the magnitude of the price elasticity of demand. Fedderke (2004) uses both sector uncertainty measured by the volatility of output and systematic uncertainty measured by the political instability, and conclude that both uncertainties affect investment spending of middle income countries negatively. Caballero and Pindyck (1996) uses four digit U.S industries data to construct uncertainty variable. They state that industry uncertainty variable have larger effects on firm investment spending as compared with firm specific uncertainty. Antoshin (2006) employs output price uncertainty as a proxy of industry wide uncertainty; he claims that the effects of output price uncertainty are ambiguous depending on the level of output price.

There are many researches employing firm specific uncertainty to clarify whether firm specific uncertainty is more explanatory and effective than aggregate and industry wide uncertainty proxies. Bo and Lensink (2000) use stock market prices of firms to construct uncertainty proxy for Dutch firms. They calculate proxy via GARCH models and find nonlinear results between uncertainty and investment. Bo (2002) also investigate demand uncertainty and investment relation by calculating idiosyncratic uncertainty with state space model, and using GMM estimation found depressing effect of idiosyncratic uncertainty. Moreover, he claimed that the effects of idiosyncratic uncertainty are more effective than economy wide uncertainty. Bo and Sterken (2002) considering the risk attitude of the firm and using firms' interest rate as proxy calculated by both AR(1) process and normal variance, issue positive results for Dutch firms.

Ogawa and Suziki (2000) investigate firm level uncertainty using growth rate of real sales of the Japanese firms computed with three different measures for uncertainty and demonstrate negative relations. In addition, the uncertainty constituted by real sales growth of firms, to exclude the effects of other factors from firm's uncertainty, they construct idiosyncratic uncertainty variable and again reach negative results. Shinada (2007) also investigates this relation for Japanese firms using firms' productivity of growth as a proxy for uncertainty and point out negative results. Baum, Çağlayan, and Talavera (2007) use firm level uncertainty derived from stock prices of the firm and market uncertainty proxy and declare the conclusion that firm specific uncertainty is more important than market uncertainty. Böhm, Funke, Siegfried (1999) use daily stock returns of firm and yearly stock returns of German firms listed in Frankfurt Stock Exchange as a proxy for uncertainty, where the former is computed with GARCH method and the latter with normal standard deviation method, respectively, and notify negative relations. Harris, Nguyen and Scaramozzino (2006) for Thailand firms also reports negative results.

CHAPTER3. DATA AND MEASUREMENT OF UNCERTAINTY

3.1- COMPANY DATA SET

The empirical examination is made by using balanced panel data of Turkish manufacturing firms listed in Istanbul Stock Exchange covering the period 1992-2002 based on accounting information of the firms. Although the balance and income sheets are available till 2007, due to the fact that a new accounting system is adopted in 2003, the time period of the sample is constrained with 11 years ending in 2002. Financial organizations are excluded and solely manufacturing firms are employed. The model is estimated for the period of 1993- 2002 because when constructing the investment data the year 1992 dropped. The data obtained from income and balance sheets are defined in Appendix1.

Omitting financial organizations and dropping some firms due to insufficient information and mergers, sample reached to 116 firms where manufacture of food, beverage and tobacco sector (ISIC REV3- 15) consists of 11 firms, manufacture of fabricated metal products, machinery and equipment sector (ISIC REV3- 29/32/34) consists of 22 firms, basic metal industries (ISIC REV3-27) consists of 10 firms, manufacture of non-metallic mineral products sector (ISIC REV3-26) consists of 23 firms, textile, wearing apparel and leather industries (ISIC REV3- 17-18-19) consists of

21 firms, manufacture of paper and paper products, printing and publishing sector (ISIC REV3-21/22) and manufacture of chemicals and chemical petroleum, rubber and plastic products sector (ISIC REV3- 23/24/25) include 9 firms and 20 firms respectively

3.2- MEASUREMENT OF UNCERTAINTY

Because uncertainty is not observable, volatility of a variable is accepted as a valid proxy to construct uncertainty variable. Volatility of a variable is defined as the standard deviation of a variable; therefore, standard deviation is used to obtain the uncertainty proxy. However, the method used in the calculation of standard deviation brings about such differences in the construction of the volatility measure. Basically the methods to obtain volatility are grouped in four categories as historical volatility, ARCH models, the stochastic volatility models and option implied volatility models. Random walk, historical averages, ARMA models are the examples of the historical volatility models. In historical models, volatilities are calculated using historical data before the volatility model estimated. ARCH and stochastic volatility models are similar to each other in the sense that they use fitted distribution. Option implied volatility differs from three methods. It uses larger information set. (Poon and Granger, 2005)

In this study, to examine whether reaction of investment is sensitive to the method used in the calculation of standard deviation, three methods are utilized; GARCH modeling, standard deviation of unpredictable part of stochastic variable and the normal standard deviation of the variable. Moreover, in order to measure sensitivity of reaction of investment to different source of uncertainties, three variables are employed; real effective exchange rate, real wage indexes of each industry and net sales

of each firm which represent economy wide, industry wide, and firm specific uncertainty, respectively. These estimations are performed by using Eview5.

3.2.1- Measurement of Economy Wide Uncertainty

Monthly real effective exchange rate index (1995=100) from 1980:01 to 2006:12 obtained from Central Bank of Republic of Turkey is used to construct the uncertainty variable. However, because investment data is deflated taking 1994 as the base year, 1995 base year of this index is converted to 1994=100[1].

As mentioned above, three different methods are used. Firstly, to compute conditional volatility of real exchange rate, GARCH (1,1) method is applied. Pozo (1992), Özbay (1999), Ogawa and Suziki (2000), Sérven (2002) Byrne and Davis (2003), Lensink and Bo (2005) and many other researchers employ different kind of GARCH modeling to construct uncertainty proxy. GARCH models seem quite popular method for volatility in empirical investment studies on account of the belief that GARCH models captures volatility more sensitively than the other methods.

[1] For this, mean of the index for each year is calculated and hence, monthly index is converted to the annual index. After that, the annual index with 1995=100 base year is transformed to the 1994=100 base year. On the other hand, because GARCH and AR process is convenient with high frequent data, retransformation of annual data to the monthly data is a requirement. For this transformation, monthly index with 1995=100 is divided with mean level of its year and thus specific rates which capture the information about the weight of per month to its year is found. In last process, 1994=100 yearly index is multiplied with these specific rates and hence transformation is completed.

GARCH model consists of two equations; mean equation and conditional variance equation. Mean equation is represented by equation [3.1];

$$[3.1] \quad y_t = a_0 + a_1 y_{t-1} + a_2 y_{t-2} + a_{t-3} y_{t-3} + ... + \varepsilon_t$$

If the error process is,

$$[3.2] \quad \varepsilon_t = v_t \sqrt{h_t}$$

Then, variance equation becomes,

$$[3.3] \quad h_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 + \sum_{i=1}^{p} \beta_i h_{t-i}$$

The conditional variance of ε_t is the ARMA process given by the expression h_t in equation [3.3]. To be well defined, the constraints $\alpha_0 > 0$, $0 < \alpha_i < 1$ and $0 < \beta_i < 1$ must be satisfied. Additionally, for stationary process, sum of the coefficient of the variance equation must be small than 1. (Enders, 2004:118)

Real effective exchange rate series are differenced by virtue of Augmented Dickey Fuller Test. After investigating the behavior of the data, AR (1,3)- GARCH(1,1) model is chosen among alternative specifications to construct exchange rate uncertainty variable[2]. The results of the model used are;

$$[3.4]\quad DER_t = -0.006463 + 0.287257 DER_{t-1} - 0.152870 DER_{t-3} + \varepsilon_t$$

$$\text{Se} \quad (0.19149) \quad (0.06447) \quad (0.05156)$$

$$\text{Pr} \quad (0.9731) \quad (0.0000) \quad (0.0030)$$

$$[3.5]\quad h_t = 3.251831 + 0.364288 \varepsilon_{t-1} + 0.421560 h_{t-1}$$

$$\text{Se} \quad (0.5555) \quad (0.0688) \quad (0.0664)$$

$$\text{Pr} \quad (0.0000) \quad (0.0000) \quad (0.0000)$$

The coefficients in the estimation satisfy all required conditions for well defined GARCH processes. The coefficient of ε_{t-1} and h_{t-1} is bigger than 0 but less than 1. In addition, the sum of the coefficients of variance is less than 1. As seen in Appendix 2, serial correlation problem is solved in the mean equation. ARCH LM test also indicates that there are no remaining arch effects in the model.

In order to construct the uncertainty variable, after estimating GARCH model, one-step ahead conditional variance data are saved. By taking the square root of

[2] See Appendix2

conditional variance series, one-step ahead standard deviations for each observation are found. Hence monthly standard deviation data are obtained. In the sense that annual investment data have to be used within panel estimation, converting monthly data to annual data is required. For this reason, mean of the standard deviation of each 12 month is calculated as an uncertainty measure of real effective exchange rate. The exchange rate uncertainty variable calculated with this method is abbreviated with GER.

Second way to construct uncertainty is to compute the standard deviation of unpredictable part of stochastic variable. For this, AR type function is performed. For stationary AR process, inverted roots must lie inside the unit circle (Enders, 2004:51).

$$[3.6]\quad y_t=a_0+a_1y_{t-1}+a_2y_{t-2}+.....+\varepsilon_t$$

Among the alternative specifications the AR (1,3) specification is preferred[3]. As seen below, estimation results are satisfactory,

$$[3.7]\quad DER_t=-0.0808+0.3302DER_{t-1}-0.0967DER_{t-3}+\varepsilon_t$$

$$\text{Se}\ (0.27366)\ (0.05256)\ (0.04455)$$

$$\text{Pr}\ (0.7680)\ (0.0000)\ (0.0306)$$

[3] See Appendix2

To obtain the second exchange rate uncertainty proxy, one-period ahead forecast errors (residuals) estimated from above equation are saved. Since it is assumed that firms take into account only past three years of stochastic variable, for the calculation of standard deviation with monthly residual data, it is considered that firms uses all information from current month to 36 month prior. Then, standard deviations are computed using this residual and monthly volatility data are converted to the annual volatility data with the same approach mentioned above. The obtained uncertainty variables are demonstrated with AER abbreviation.

Normal standard deviation formula for volatility measure of stochastic variables calculated considering past three years of observations is used as third way. To obtain volatility, the same approach is employed both in calculation and conversion of standard deviations. The applied formula is,

$$[3.8] \quad \sigma = \sqrt{\frac{\sum\left(y-\bar{y}\right)^2}{\left(n-1\right)}}$$

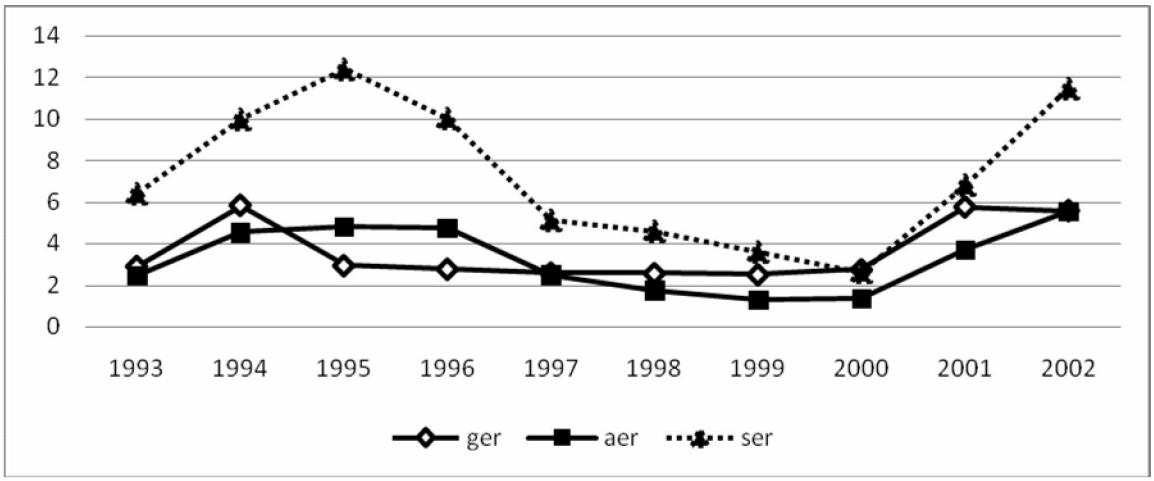
The uncertainty proxies are depicted in Table3.1. As seen from the Table 3.1 and Figure3.1, standard deviation of real effective exchange rate nearly doubled in 1994 and 2001 which are the crises years of Turkey. After, 1995 the declining trend till 2000 is seen.

Table 3. 1: Exchange Rate Uncertainty Variables

YEARS	GER	AER	SER
1993	2.917339	2.435998	6.416369
1994	5.831387	4.540872	10.00543
1995	2.953222	4.791914	12.41308
1996	2.783383	4.735529	10.04053
1997	2.596896	2.466301	5.13702
1998	2.573035	1.723985	4.607924
1999	2.519126	1.283006	3.611279
2000	2.755147	1.34243	2.623515
2001	5.753242	3.683915	6.836535
2002	5.58005	5.534286	11.47891

GER is the exchange rate uncertainty calculated with GARCH Modeling. AER is the exchange rate uncertainty calculated with AR Modeling. SER is the exchange rate uncertainty calculated with normal formula.

Figure 3. 1: Exchange Rate Uncertainty*



*GER is the exchange uncertainty variable computed with GARCH estimation. AER is the exchange uncertainty variable computed with AR estimation. SER is the exchange uncertainty variable computed with normal formula of standard deviation

All methods capture the increment in 1994 and 2001 which are the year of deep crises in Turkey. In 1995, GER indicates a decrease in uncertainty, AER indicates no significant changes in the perception of uncertainty, SER indicates that instability in exchange rate beginning from 1994 continue to increase in 1995. After 1996, all uncertainty proxies have declining trend and AER and SER almost move in similar

patterns till 2002. After 2000, increment in volatility is seen explicitly in all uncertainty variables. As happened in 1995, GER in 2001 indicates declining trend and other two uncertainty proxy postulates the increasing trend in uncertainty. According to the Ogawa and Suzuki (2000), these different movements arise from the fact that in GARCH type modeling the full information set is used to obtain standard deviation of a variable in current period. However, AR modeling and standard deviation formula uses information set prior to that year. Spearman rank correlation coefficient between GER and AER are 0.7091, GER and SER 0.6970, AER and SER 0.9636.

3.2.2- Measurement of Industry-Wide Uncertainty

Quarterly nominal wage indices of production workers working in manufacturing industry with 1997=100 base for each industry are taken from the Central Bank of the Republic of Turkey for the period 1992- 2006.[4] Because original data is nominal, the industry specific wholesale price index with 1994=100 base is used to deflate and produce the real index for wage. One problem emerges from the fact that nominal indices are computed with 1997=100 base but price indexes are available with 1994=100 base. Because of this problem, 1997=100 base year of the nominal wage indices are converted into 1994=100 base[5]. Then real wage indices are computed.

When industry wide uncertainty measure is constructed, three methods mentioned above are used. However, because GARCH modeling is appropriate with high frequency data, small sample bias emerges in estimation procedure. Besides, some series do not indicate the conditional heteroskedasticity problem while some of them

[4] ISIC REV3 15, 17,18,19,21, 22, 23, 24, 25, 26, 27, 29, 32, 34 are the industries used in the calculation.
[5] This problem is solved with the same way in the real effective exchange rate transformation.

indicate. In addition to these problems, because uncertainty measure is calculated for different industries in the sample, it is seen that convenient estimation models for GARCH estimation differ among industries. For this reason, while industries data are mostly d-trended and modeled using AR(1)-GARCH(1,1) specification, some industries data are differenced and alternative GARCH specifications are preferred for them.[6]

As for AR modeling of the series, although serial correlation remains in some industries with AR(1) modeling, due to the high correlation obtained from other specifications, AR(1) specification is used for all industries in sample to compute standard deviation of unpredictable part of stochastic variable[7]. Because of the space, the estimation results for each industry are presented in Appendix3.

Standard deviations obtained from outcomes of the GARCH model, AR model and normal formula are transformed with the same method in exchange rate uncertainty. GW represents wage uncertainty computed by GARCH estimation method. AW is the abbreviation of wage uncertainty computed by AR (1) modeling. SW is obtained by normal standard deviation formula.

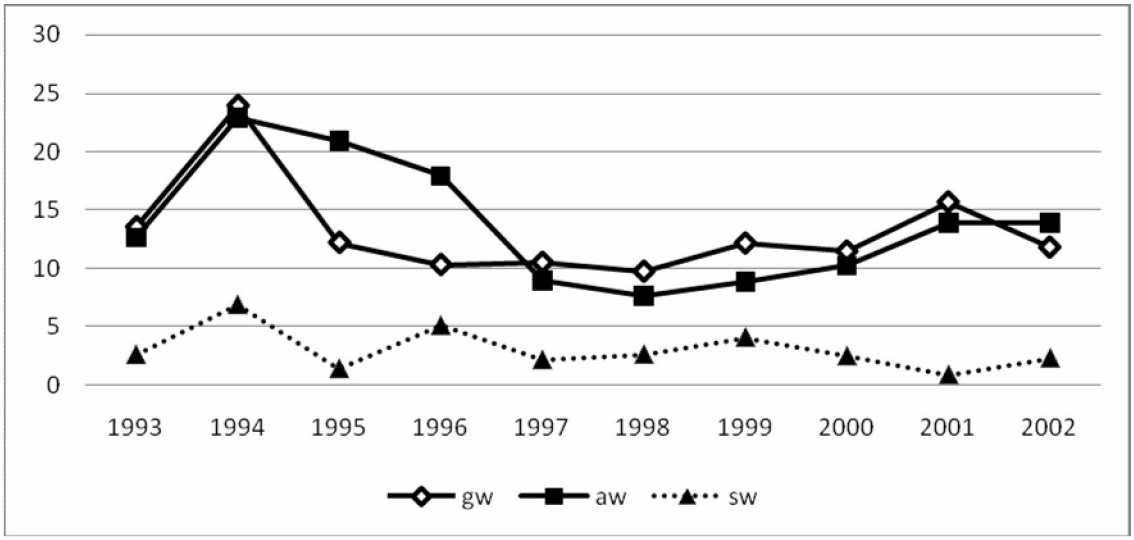
Figure 3.2 shows the yearly movements of the real wage uncertainty proxies. And Table 3.4 issues the wage uncertainty proxies obtained and used in the estimation.

[6] The data of 15, 21, 22,23,24,25, 32 and 34 are d-trended and modeled using AR(1)-GARCH(1,1) specification. The data of 26 are d-trended and modeled using ARMA (1,5)-GARCH(1,1) specification. The data of 27 and 29 are d-trended and modeled using AR (1)-ARCH(1) specification. The data of 17, 18 are differenced and modeled using AR (1)-GARCH (1,1) specification. And, the data of 19 are differenced, ARMA (5,5)-GARCH(1,1) specification is used.

[7] The data of 17, 18 and 19 are differenced. Remaining industries index are d-trended. AR (1) model specification is used for all industries.

As seen from the Figure 3.2, although proxies of uncertainty mostly capture the same trend, in some years, they move in different directions. SW moves opposite direction in 1996 and 2001. Although GW decreases in 2002, other uncertainty variables increase. Spearman rank correlations of three variables indicate that correlation between GW and AW is 0.7682, GW and SW 0.3122, SW and AW 0.2883.

Figure 3. 2: Real Wage Uncertainty *



* GW is the real wage uncertainty variable computed with GARCH estimation. AW is the real wage uncertainty variable computed with AR estimation. SW is the real wage uncertainty variable computed with normal formula of standard deviation

3.2.3- Measurement of Firm Specific Uncertainty

Net sales data are obtained from firms' income statements. This data is annual and available only for the period 1992-2002, so that using GARCH and AR type models are not appropriate because of the severe small sample biases. Hence, only normal

standard deviation formula is preferred as a way to obtain volatility. SNS is the abbreviation used in the specification.

3.3- DESCRIPTIVE STATISTICS OF THE VARIABLES

Table 3. 2: Descriptive Statistics of Variables Used in Models

Variables	Mean	Median	Standard deviation	Coefficient of variation	Skewness	Kurtosis
I	1.451	1.231	1.090	0.751	3.155	24.35
NS	7.291	4.397	13.049	1.789	10.50	172.4
NP	0.274	0.285	2.908	10.60	-16.98	352.7
GER	3.626	2.850	1.379	0.380	0.848	1.770
AER	3.253	3.075	1.509	0.463	.0497	1.446
SER	7.317	6.626	3.269	0.446	.1680	1.605
GW	13.16	10.38	8.887	0.674	3.244	18.24
AW	13.77	10.86	11.17	0.811	2.767	11.44
SW	3.080	2.427	2.461	0.798	1.301	5.152
SNS	96204	22134	3228	3.356	10.62	150.3

I (I/K_{t-1}): ratio of gross investment to the previous year capital stock; NS (NS/K_{t-1}): ratio of net sales to the previous year capital stock; NP (NP/K_{t-1}): ratio of the net profits to the previous year capital stock; GER is the exchange uncertainty variable computed with GARCH estimation. AER is the exchange uncertainty variable computed with AR estimation. SER is the exchange uncertainty variable computed with normal formula of standard deviation. GW is the real wage uncertainty variable computed with GARCH estimation. AW is the real wage uncertainty variable computed with AR estimation. SW is the real wage uncertainty variable computed with normal formula of standard deviation. SNS is the firm specific uncertainty variable computed with normal formula of standard deviation formula.

Table 3.2 displays descriptive statistics for all the data in the sample. Coefficient of variation is used to compare which variable is more volatile, because standard deviation may mislead in the case variables have mean in different sizes. As seen in Table 3.2, net profit is the most volatile variable in the sample. As for the uncertainty variables, it is seen that firm-specific uncertainty variable is more volatile than the other uncertainty variables. Exchange rate uncertainty variables appear less volatile than wage uncertainty variables. Skewness and kurtosis postulates that all variables in the sample have non-normal distributions.

Table 3.3 Spearman Rank Correlation between Dependent Variable and Independent Variables

	I	NS	NP	GER	AER	SER	GW	AW	SW	SNS
I	1.00									
NS	0.431*	1.00								
NP	0.430*	0.53*	1.00							
GER	0.13*	0.0322	0.05***	1.00						
AER	0.11*	0.05***	0.15*	0.70*	1.00					
SER	0.12*	0.07**	0.18*	0.69*	0.96*	1.00				
GW	-0.02	0.05***	-0.10*	0.29*	0.06**	0.08*	1.00			
AW	0.006	0.0791*	-0.014	0.46*	0.43*	0.44*	0.76*	1.00		
SW	-0.02	0.063**	0.05***	-0.03	-0.08**	-0.06*	0.31	0.28	1.00	
SNS	-0.04	0.18*	0.12*	0.003	-0.05***	-0.02	0.07*	0.07**	0.06***	1.00

Table 3. 4.- Real Wage Uncertainty Variables Used in the Specification

		15	17	18	19	21	22	23	24	25	26	27	29	32	34
1993	**GW**	8.480	24.451	19.389	49.248	15.468	7.5723	18.927	9.9500	11.144	8.7909	17.541	9.443	15.166	8.3441
	AW	8.644	32.079	13.758	15.775	13.626	8.3912	11.676	7.9880	8.5559	7.3502	20.543	7.4984	10.09	6.3438
	SW	2.404	2.9330	2.9905	2.3859	4.9109	4.367	4.2986	1.0775	2.4292	2.3757	3.9144	1.9769	5.2801	0.9827
1994	**GW**	7.809	58.172	70.729	63.237	20.504	6.1515	22.984	13.721	16.990	16.736	31.753	10.075	19.019	6.6325
	AW	8.873	67.231	52.810	51.048	18.142	6.7836	19.019	14.509	14.200	12.442	31.065	9.1392	12.026	9.8986
	SW	8.340	6.3753	5.7057	4.7957	6.3143	7.7655	6.4629	7.3944	6.9753	8.3889	6.392	6.1493	3.3331	5.6194
1995	**GW**	6.465	16.435	17.482	25.100	17.697	9.6984	7.665	9.9144	14.899	12.001	15.601	7.5617	19.918	6.8926
	AW	6.852	56.550	45.063	43.504	18.8	7.3483	18.207	13.715	15.245	12.421	27.931	9.6406	16.223	11.577
	SW	1.076	2.8651	0.5654	0.8774	1.1167	3.3003	0.7998	1.0402	0.6399	1.1639	3.8097	0.407	1.6761	0.2893
1996	**GW**	6.369	19.201	21.350	9.2801	12.088	11.488	9.2164	8.6142	7.3358	6.1036	13.846	6.4178	21.575	8.2118
	AW	6.695	46.218	39.952	37.042	16.715	9.3854	14.878	11.375	13.246	11.080	23.303	7.5763	17.074	10.511
	SW	2.787	5.8175	2.7080	4.8318	6.3893	3.4479	11.911	6.2588	6.2319	3.3836	12.418	3.3427	5.9006	1.8629
1997	**GW**	6.863	18.337	19.424	7.0950	13.855	8.5944	17.586	8.8575	5.8803	5.1165	15.391	7.3922	25.116	8.6916
	AW	6.536	13.668	11.206	11.760	13.292	10.517	10.867	7.1037	9.1043	5.5225	11.275	5.915	20.586	7.8367
	SW	0.613	2.8437	3.0806	0.5617	6.3379	1.3858	2.2781	2.0972	2.293	0.3441	2.4277	1.2895	16.18	2.4503
1998	**GW**	7.221	16.404	17.103	5.9730	10.875	8.1608	14.690	9.6220	9.7056	4.2444	13.826	7.4965	16.58	8.7109
	AW	6.780	10.136	8.0013	7.4930	10.414	9.9812	13.411	7.2817	6.9827	3.5661	10.288	4.9806	28.423	6.7576
	SW	0.414	2.2437	1.0437	0.8089	5.1466	0.7047	3.8302	2.9799	4.5756	1.0983	6.7888	2.6854	2.2635	3.0056
1999	**GW**	8.170	25.425	20.080	15.268	20.017	8.3726	15.476	9.6476	11.311	4.0353	16.967	8.1285	17.586	8.1186
	AW	8.161	12.343	8.9528	11.842	13.423	8.6525	14.954	7.6508	7.6358	3.9067	12.477	6.0737	27.193	8.1975
	SW	4.783	6.7309	0.8836	8.0549	7.7755	3.0193	0.8360	3.0589	3.0566	1.9491	5.5679	4.5963	2.6939	4.4172
2000	**GW**	9.251	18.237	19.616	19.778	19.404	13.609	12.187	9.6479	10.371	4.2466	14.791	9.7679	21.218	8.3222
	AW	8.808	17.771	7.9880	19.503	18.407	10.752	12.998	8.0118	9.5934	3.6625	12.751	7.9925	24.835	8.5186
	SW	4.117	1.4216	1.2052	1.8756	2.3537	6.2444	1.4036	2.6667	1.0318	1.1676	4.0242	4.5663	1.5005	2.7118
2001	**GW**	10.92	26.052	17.478	14.166	16.673	10.399	18.179	13.609	12.413	12.192	22.715	15.799	22.06	7.7749
	AW	11.19	23.477	10.366	21.977	21.095	12.051	14.617	12.751	11.381	7.4589	18.625	13.842	19.18	9.2925
	SW	0.703	0.6552	0.0410	0.8013	0.972	0.8706	1.6596	1.0254	1.8969	1.1740	1.1045	0.5236	0.2391	0.5092
2002	**GW**	9.983	19.016	16.769	8.8003	16.748	9.8809	6.6044	10.611	14.314	7.7504	17.602	6.2517	22.421	7.9067
	AW	11.502	20.887	9.5207	17.653	19.269	12.305	12.6178	13.742	12.943	8.5215	19.388	14.024	23.651	9.6010
	SW	0.984	5.5458	1.3137	4.4722	6.0843	0.0757	0.12197	2.0362	4.0658	0.4630	2.45636	1.7780	2.6577	1.7671
Total Mean	**GW**	8.153	24.173	23.942	21.794	16.333	9.3928	14.3518	10.4196	11.436	8.1218	18.0037	8.8334	20.066	7.9606
	AW	8.404	30.036	20.761	23.760	16.318	9.6169	14.3250	10.4132	10.889	7.5933	18.7651	8.6684	19.928	8.8534
	SW	2.622	3.7432	1.9537	2.9465	4.7401	3.1181	3.36027	2.96355	3.3196	2.15086	4.89044	2.7315	4.1725	2.3615

CHAPTER 4: PANEL DATA ESTIMATION

4.1- ECONOMETRIC SPECIFICATION OF INVESTMENT MODEL

Jorgenson (1971) indicates that all investment theories constitute their model in three stages. One stage is the construction of the adjustment between capital stock and desired capital stock. Second stage is the construction of the replacement cost. Third stage is the construction of the determinants of desired capital stock. First stage can be summarized by the below formula;

$$[4.1] \quad K_t - K_{t-1} = [1-\lambda]\left[K_t^* - K_{t-1}\right]$$

In second stage, replacement cost is added to the net investment function. Hence gross investment is obtained. In this model, replacement is accepted proportional to actual capital stock. Second stage can be shown as;

$$[4.2] \quad K_t - K_{t-1} = I_t - \delta K_{t-1}$$

With the combination of these three stages, investment expenditure model can be obtained.

$$[4.3] \quad I_t = \left[1-\lambda\right]\left[K_t^* - K_{t-1}\right] + \delta K_{t-1}$$

As mentioned, third stage is related with the decision of the determinants of desired capital stock (K_t^*). It is important because theories of investment, while accepting validity of same capital formulation and replacement, are diverging in their determinants of the desired capital.

In flexible accelerator model developed Chenery (1952), it is assumed that capital is adjusted toward its desired level in each period by a certain proportion of the discrepancy between desired and actual capital as indicated in stage one. Jorgenson and Siebert (1968) indicate that second stage and third stage are important for flexible accelerator mechanism to construct the complete investment theory. According to flexible accelerator model, firms constitute expectations about its future output by considering past sales of the firm or industry or both. That is, firm adjusts its capital stock toward desired stock until arriving to optimum point to produce the planned output. For that reason, determination of the capital stock depends solely on sales. Chirinko (1993) indicates that relative price of inputs and the tax effects are not included into this model because firms only take into account sales as a determinant of investment. Tinbergen (Tinbergen (1939) as cited in Jorgenson and Siebert, 1968) developed an alternative specification of this flexible accelerator model. He argued that

firms build expectations not taking into consideration their sales but taking their profits. That is, in this model, desired capital and thus investment are admitted depending on profit expectations. He used the realized profits as the profit expectations in empirical analysis.

Although neo-classic investment theory assumes similar process for adjustment mechanism and replacement cost, it differs for demand theory of capital. In Neo-classic theory, desired capital depends on the neoclassical theory of optimal capital accumulation. As a result of optimization, desired capital stock is accepted depending on both planned output and the ratio of output price to implicit rental price of services of capital goods. Hence, relative prices of the factors of production are introduced to the investment theory (Bischoff et al., 1971). The combination of the relationship between changes in the demand for capital services and actual investment expenditures, the theory of replacement investment, and the theory of demand for capital builds the neoclassical theory of the investment. Chirinko (1993) stresses that Jorgenson investment model turns to the flexible accelerator model if it is assumed that elasticity of substitution between capital and variable inputs is accepted to be equal to zero.

Another important investment model is the q theory of investment which firstly developed by Tobin (1969). This model is accepted as investment model with explicit dynamics because it adds adjustment cost technology and expectations in to the optimization process explicitly (Chirinko, 1993). In this model the rate of investment is a function of q defined as the ratio of the market value of new additional capital goods to their replacement cost. If firm tries to maximize its market value, when the marginal addition to the firm's market value is more than the cost of goods, firm will increase

their capital goods (Bischoff et al., 1971). That is, whenever capital is valued more highly in the market than the cost to produce it (its replacement cost), investment is provoked or vice versa (William and Tobin, 1968). With solving maximization problem, it is reached that firms market value depends on the expected shadow price of capital.

Although there have been many types of investment models, in this study, two investment models are preferred for examination due to the data limitation. The one is flexible accelerator investment model and the other is cash flow investment model. These two models are augmented by three different uncertainty measures. The aim is not only to investigate what type investment models are more significant than others, but to investigate whether the impact of uncertainty is robust to the alternative specification of the models and the alternative measurements of uncertainty proxies.

Accelerator investment type function is augmented by three uncertainty variables measured with GARCH, AR and normal formula methods and estimated models are called as Model1, Model2 and Model3. The specification is written as;

$$[4.4] \quad \frac{I_{it}}{K_{it-1}} = \mu_i + \lambda_t + \beta_1 \frac{NS_{it}}{K_{it-1}} + \beta_2 U_t + \varepsilon_{it}$$

Another type of investment model applied in this study is the cash flow investment function which includes net profits as a determinant of investment. This

equation is also estimated for three different methods of uncertainty and called as Model4, Model5 and Model6.

$$[4.5] \quad \frac{I_{it}}{K_{it-1}} = \mu_i + \lambda_t + \beta_1 \frac{NS_{it}}{K_{it-1}} + \beta_2 U_t + \beta_3 \frac{NP_{it}}{K_{it-1}} + \varepsilon_{it}$$

I_{it} : Investment of the ith firm in t year

K_{it-1} : Capital stock of ith firm at the end of the year t-1

NS_{it} : Net sales of the ith firm in year t

NP_{it} : Net Profits of the ith firm in year t

μ_i : Firm effect

λ_t : Time effect

U_t : Measure of uncertainty

ε_{it} : Disturbance term of ith firm in year t.

$\beta_1, \beta_2, \beta_3$: Parameters in the investment function. It is expected to find $\beta_1 > 0$, $\beta_2 \gtreqless 0$ $\beta_3 > 0$

4.2- ESTIMATION METHOD

Panel data estimation is performed using Stata10. To decide whether model have to be estimated with individual effect or not, pooled model regression is compared with both fixed effect regression and random effect regression using F test and Breusch-Pagan LM test statistics. In the investigation, it is found that model must be specified considering individual effects.

The choice of whether individual specific effects are modeled as random or fixed, Hausman test is employed. If the individual effects are correlated with the regressors of the model, fixed effect estimation must be examined. If there is no correlation between regressors and individual effects, random effects should be used. However, one caution must be done. If the true model is fixed effect model, then estimators of random effects and pooled OLS models are inconsistent. When true model is random effect model or pooled OLS model, estimating fixed effect regression produces consistent but inefficient results (Cameron and Trivedi, 2005:699). The result of Hausman test suggests accepting firm specific effect as fixed and applying within-group estimation.

In addition to the Hausman test, Stata10 offers another test to decide whether model is fixed or random. This test is known as Hansen-Sargen test. The logic of the test is that comparing fixed and random models can also be seen as a test of overidentifying restrictions. Fixed effect estimator uses the orthogonality condition that the regressors are uncorrelated with the idiosyncratic error and random effects estimator uses additional orthogonality condition that the regressors are uncorrelated with the

group- specific error term. This additional orthogonality condition in random effects model is admitted as overidentifying restrictions. Hansen-Sargen test also suggests applying fixed effects specification. The presence of time effect is examined comparing pooled and fixed effect regression. By virtue of F test statistics, time dummies are added to capture the impacts of business cycle into the equation. Considering these test results, two-way fixed effects model is constructed.

Due to the possibility of heterogeneity, robust standard errors are used. Frees, Pesaran and Friedman tests are employed to investigate the cross sectional dependency. Although cross sectional independency is not rejected by Pesaran and Friedman tests, Frees test indicates the dependency problem. Because Pesaran and Friedman tests have same weakness that they use the sum of the pair-wise correlation coefficients of residual matrix, these tests may omit the cross sectional dependency in the case the sign of the correlations cancels out each other when averaging. Therefore, these tests may not be reliable. In fact, when looking at average absolute value of the off-diagonal elements of the cross sectional correlation matrix of residual, it is seen that sign of the correlation is alternating which makes Pesaran and Friedman test unreliable. For this reason, cross sectional dependency problem is taken into account and potential inefficiency problem is solved using standard errors proposed by Driskoll- Kraay. (De Hoyos and Sarafidis, 2006)

As a result of the testing process, the fixed effects results both using the robust standard error and Driskoll-Kraay standard error are issued in Tables.

4.3- ESTIMATION RESULTS

4.3.1- The Effects of Economy Wide Uncertainty: Exchange Rate Uncertainty

To assess the impact of uncertainty affecting all economy on firms' investment decisions, real effective exchange rate volatility is chosen as representative among other proxies. Evaluating exchange rate uncertainty is significant because not only it captures the relationship between investment and cost of capital but also links the international affairs into the investment decision. Moreover, exchange rate uncertainty can be accepted as both demand and cost uncertainty.

The positive effect of sales over investment decision is convenient with the claims of accelerator investment model for all estimated models. That means an increment in net sales leads to an increment in gross investment spending. The signs of all uncertainty variables in accelerator investment model are positive and statistically significant at %1 level for both robust standard errors and Driskoll-Kraay standard errors. It seems that exchange rate uncertainty affects gross investment positively.

Model 4, 5 and 6 is the cash flow investment models augmented with three different measurement of exchange rate uncertainty like in accelerator type investment models. Cash flow type investment equation is also examined to test the robustness of the uncertainty results. Apart from it, the addition of the Net profit to the equation leads to estimate whether internal source of firms is a valid determinant of investment spending. The coefficients of the net profit are positive and statistically significant at the

%10 level. Positive and significant coefficient of net profit leads that firms in the sample need to the profits to finance their investment spending, that is, firms are financially constrained. However, finding exact reasons why firms are financially constrained is not possible in the view of this study. The results issued demonstrate that uncertainty affects gross investment positively and significantly in cash flow investment model.

Table 4. 1- The Effects of Exchange Rate Uncertainty on Investment

	ACCELERATOR MODEL			**CASH FLOW MODEL**		
I	**Model1**	**Model2**	**Model3**	**Model4**	**Model5**	**Model6**
NS	.033964 (.0077)* (.0053)*	033964 (.0077)* (.0053)*	033964 (.0077)* (.0053)*	0.03558 (.0094)* (.0068)*	0.03558 (.0094)* (.0068)*	0.03558 (.0094)* (.0068)*
NP				0.03539 (.0193)** (.0194)***	0.03539 (.0193)** (.0194)***	0.03539 (.0193)** (.0194)***
GER	0.151228 (.0363)* (.0021)*			0.15703 (.0362) (.0032)*		
AER		0.108884 (.0261)* (.0015)*			0.11306 (.0260)* (.0023)*	
SER			0.040711 (.0126)* (.0005)*			0.04252 (.0126)* (.0009)*
R^2	0.1679	0.1679	0.1679	0.1766	0.1766	0.1766

*Significance level at %1, ** Significance level at %5, ***Significance level at %10

NS is the ratio of the net sales to the previous year capital stock. NP is the ratio of the net sales to the previous year capital stock. GER is the real effective exchange rate uncertainty variable computed with GARCH modeling. AER is the real effective exchange rate uncertainty variable computed with AR modeling. SER is the real effective exchange rate uncertainty variable computed with normal standard deviation formula.

Issued R^2 s are within R^2. First line demonstrates the β coefficients. Second and third line indicates the robust standard errors and Driskoll-Kraay standard errors, respectively.

Since exchange rate uncertainty is effective in overall country and admitted as both demand and cost uncertainty, the effects of it over the relative prices are important. As indicated in Goldberg (1993), since expected cost of production and expected revenues from international sales are affected by exchange rate uncertainty, positive reaction of the sample firms to the uncertainty can be understood. Darby et al (1999) and Hallett et al. (2004) state that the condition of positive results can be explained with low scraping cost or high opportunity cost of waiting. The positive signs also point out the possibility that relation between real effective exchange rate uncertainty and investment may be modeled as nonlinear. Non-linear relation means low levels of uncertainty provoke investment spending while higher level of uncertainty diminishes.

4.3.2- The Effects of Industry Wide Uncertainty: Real Wage Uncertainty

The effects of the real wage uncertainty investment model are reported in Table 4.2. The sign of the coefficient of net sales variable confirms the claims of accelerator investment model. As it is seen, industry wide uncertainty calculated from real wage index exerts negative impact on investment spending and this result is valid for three measures of uncertainty with using Driskoll-Kraay standard errors in fixed effects specification. However, the proxies that are represented by AW and SW loose significance, when the results are issued with robust standard error.

In the cash flow investment model, it is found that the signs of the three uncertainty variables are negative and statistically significant. Net profit is also

significant at %10 level. Although AW and SW are not statistically significant with robust standard errors, they are significant with Driskoll-Kraay standard errors.

Table 4. 2-The Effects of Real Wage Uncertainty on Investment

	ACCELERATOR MODEL			CASH FLOW MODEL		
I	**Model1**	**Model2**	**Model2**	**Model4**	**Model5**	**Model6**
NS	0.03558 (.0052)* (.0075)*	0.03415 (.0052)* (.0077)*	0.03387 (.0053)* (.0078)*	0.03736 (.0075)* (.0070)*	0.03576 (.0077)* (.0068)*	0.03549 (.0078)* (.0069)*
NP				0.03674 (.0193)*** (.0194)***	0.03534 (.0193)*** (.0194)***	0.03525 (.0193)*** (.0194)***
GW	-0.01380 (.0046)* (.0039)*			-0.014602 (.0045)* (.0044)*		
AW		-0.00361 (.0033) (.0017)**			-0.003546 (.0033) (.0017)**	
SW			-0.02261 (.0153) (.0092)**			-0.02200 (.0153) (.0095)**
R^2	0.1735	0.1686	0.1692	0.1829	0.1773	0.1779

*Significance level at %1, ** Significance level at %5, ***Significance level at %10

NS is the ratio of the net sales to the previous year capital stock. NP is the ratio of the net sales to the previous year capital stock. GW is the real wage uncertainty variable computed with GARCH modeling. AW is the real wage uncertainty variable computed with AR modeling. SW is the real wage uncertainty variable computed with normal standard deviation formula.

Issued R^2 s are within R^2 .The first line demonstrates the β. coefficients. Second and third line indicates the robust standard errors and Driskoll-Kraay standard errors, respectively.

Industry wide uncertainty is important because it affects the entry decision to the industry and exit decision from the industry. As indicated in Pindyck (1993) negative results are anticipated when the uncertainty is introduced as industry specific. Since uncertainty is effective in industry, industry specific machines and plants cannot be sold to any other firms operating industry immediately, therefore, waiting is provoked which affects investment negatively. Negative effects may be related with the fact that this uncertainty affects cost of production directly.

4.3.3- Firm Specific Uncertainty: Net Real Sales Uncertainty

It is important to see the results of uncertainty only specific to the firm in order to eliminate the effects of shocks prevailing within a country or an industry. However, exact separation of shocks cannot be possible in the examination and in the interpretation. For this reason, researchers have tried to eliminate the impact of industry and country wide uncertainty from firm specific uncertainty proxy using residuals obtained from appropriate econometric model which runs out the effects of other uncertainties. This uncertainty proxy is called idiosyncratic uncertainty and accepted just related with firms' shocks. However, because trustable construction of econometric model to get idiosyncratic uncertainty proxy seems not possible with data used in this examination, standard deviation of net real sales of firms computed with normal formula is accepted as a representative proxy for firm specific uncertainty.

According to the results of Table 4.3, the net sales and net profits affect investment positively. That is, an increment of sales or profits increases investment spending. Firm specific uncertainty variable (SNS) affects investment negatively and

significantly in both investment models. That is, when firm faces with demand uncertainty arising from sales fluctuations, the tendency of the investors is to diminish the investment spending.

Table 4. 3- The Effects of Firm Specific Uncertainty on Investment

I	ACCELERATOR	CASH FLOW
NS	0.034022 (.0078)* (.0053)*	0.035636 (.0095)* (.0068)*
NP		0.03532 (.0193)*** (.0194)***
SNS	-1.766e-08 (8.455e-09)* (5.468e-09)*	-1.753e-08 (8.463e-09)* (5.659e-09)*
R^2	0.1701	0.1788

*Significance level at %1, ** Significance level at %5, ***Significance level at %10
NS is the ratio of the net sales to the previous year capital stock. NP is the ratio of the net sales to the previous year capital stock. SNS is the firm specific uncertainty computed with using net sales data of firms.
Issued R^2 s are within R^2 .The first line demonstrates the β coefficients. Second and third line indicates the robust standard errors and Driskoll-Kraay standard errors, respectively.

4.4-SENSITIVITY ANALYSIS

To investigate whether the results of estimations are sensitive to the possibility of outliers, models are re-estimated. In exchange rate models, excluding the outliers do not change sign and the significance level of the coefficients of the variables in both accelerator and cash flow investment models. However, it is seen that the sensitivity of

investment models augmented with the real wage uncertainty to the outlier is high. In fixed effects specification, positive and insignificant results are found for GW uncertainty proxy. AW proxy indicates positive and significant effects as opposite of the issued models. However, nothing changed in the models using SW proxy for wage uncertainty. As seen, certain result is not obtained in the investigation of the real wage uncertainty. The results of the investment models augmented with firm specific uncertainty seem to be robust to the outliers. The estimation results excluding outliers are presented in Appendix5.

CHAPTER 5: CONCLUSION

This dissertation examines the impact of uncertainty on investment decisions of the Turkish firms using panel data set of Turkish Manufacturing firms listed in Istanbul Stock Exchange during 1993-2002. Accelerator and cash flow investment models augmented with three different uncertainty proxies, which are computed with three different methods, are estimated. It is found that both sales and profits are significant determinants for investment decision. Although there are many macro level variables to construct as proxy of the economy wide uncertainty, real effective exchange rate is chosen among alternatives. Panel data estimation results indicate that exchange rate uncertainty affects investment spending positively. However, positive results do not mean that economy wide uncertainty affects investment positively. There is possibility that uncertainty calculated from other macro economic variables such as inflation or interest rate may affects investment decision differently. Industry wide uncertainty computed from real wages of industries and firm-specific uncertainty computed from net sales of firms exert negative effects on investment decision. However, when the industry wide and firm specific uncertainty are calculated with different industry wide and firm specific variables, the signs of these relations may change.

When outliers are excluded from the specification to check the robustness of the models, except for the real wage uncertainty models augmented with GW and AW proxies, nothing has changed. For this reason, it can be claimed that different source of

uncertainty affects investment decision differently for firms listed in Istanbul Stock Exchange. However, giving exact reasons why firms react differently to the different source of uncertainty is not possible in the view of this study.

Because listed firms in Istanbul Stock Exchange are larger firms, the representativeness of the data to the Turkish economy can be discussed. Larger firms can borrow in financial markets more easily than small firms and this is an important fact for the countries having imperfect capital market. Because their stocks are traded in Istanbul Stock Exchange, they are controlled by outside stock holders which admitted as a reducing factor of asymmetric information. For this reason, generalizing the empirical results for Turkish economy and suggesting some macroeconomic policy may be false.

More empirical studies with more representative data are a requirement to reach concrete empirical evidence and to suggest some policies to evoke investment spending. To find the exact reasons when and how firms are affected by uncertainties, the sample should be grouped with considering some criteria mentioned in investment-uncertainty theoretical models such as risk aversion, financial constraints and industry specific characteristics.

APPENDICES

APPENDIX1: DATA DEFINITION

Data derived from income and balance sheet are defined as;

Capital (K): Capital is defined as the book value of the capital stock. Tangible fixed assets in balance sheet of the firm are used to form the capital stock.

Gross Investment (I): Gross capital investment is defined as net investment plus accumulated depreciation.

$$I_t = K_t - K_{t-1} + \delta K_{t-1}$$

Sales (NS): Net Sales is deduced from the income statement of the firm.

Profit (NP): Net profit after tax derived from income statement is used as a proxy for profit.

APPENDIX2: THE RESULTS OF GARCH AND ARMA PROCESS OF REAL EFFECTIVE EXCHANGE RATE INDEX

Monthly real effective exchange rate index for period of 1980-2006 is taken from CBTR in order to estimate the GARCH and ARMA process of exchange rate. Figure1 and 2 shows the level and the difference form of the series, respectively. Figures indicate the possibility that the mean and the variance of the index are non-stationary. Correlogram of the ER series also posits the non-stationarity of the series. So, correlogram of the differenced ER series (DER) is investigated. It indicates that non-stationary problem is solved. However, formal test (Augmented Dickey Fuller test) is a requirement to decide the non-stationary of the series. Histograms postulate that real effective exchange rate and the difference of the series is not normal distributed.

Figure2a.1: ER

Figure2a.2: DER

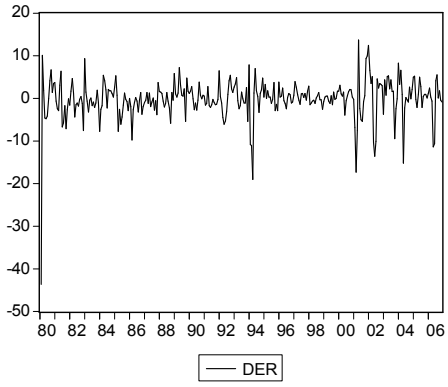


Table2a. 1- Correlogram of the ER Series

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|*******|	.|*******|	1	0.948	0.948	294.18	0.000
.|*******|	.|* |	2	0.911	0.115	566.49	0.000
.|*******|	.|. |	3	0.871	-0.033	815.90	0.000
.|****** |	.|. |	4	0.835	0.026	1046.2	0.000
.|****** |	.|. |	5	0.800	-0.009	1258.0	0.000
.|****** |	.|. |	6	0.771	0.050	1455.6	0.000
.|****** |	.|. |	7	0.748	0.055	1641.9	0.000
.|****** |	.|. |	8	0.723	-0.008	1816.8	0.000
.|***** |	.|. |	9	0.698	-0.018	1980.3	0.000
.|***** |	.|. |	10	0.671	-0.030	2131.9	0.000
.|***** |	.|. |	11	0.645	-0.003	2272.4	0.000

Table2a.2- Correlogram of the DER Series

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|* |	.|* |	1	0.180	0.180	10.564	0.001
.|. |	.|. |	2	-0.022	-0.057	10.729	0.005
*|. |	*|. |	3	-0.105	-0.094	14.353	0.002
.|. |	.|. |	4	-0.045	-0.010	15.009	0.005
.|. |	.|. |	5	-0.053	-0.051	15.923	0.007
.|. |	.|. |	6	-0.026	-0.020	16.149	0.013
.|. |	.|. |	7	-0.020	-0.020	16.280	0.023
*|. |	*|. |	8	-0.074	-0.082	18.107	0.020
.|. |	.|. |	9	0.004	0.026	18.113	0.034
.|. |	.|. |	10	-0.012	-0.031	18.165	0.052
.|. |	.|. |	11	-0.028	-0.041	18.428	0.072
*|. |	*|. |	12	-0.116	-0.114	22.944	0.028

Figure2a.3 Histogram of the ER

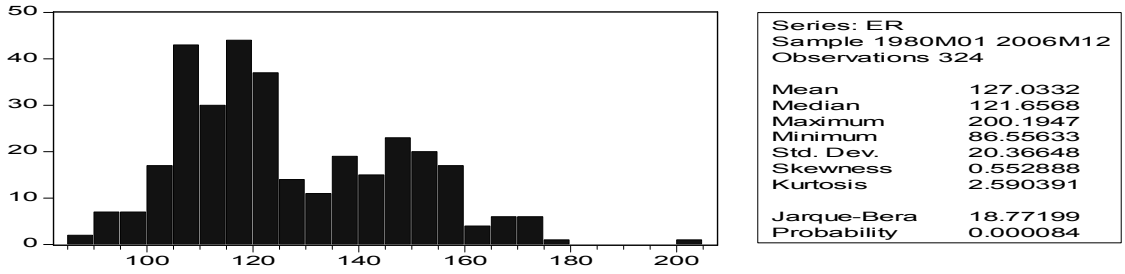
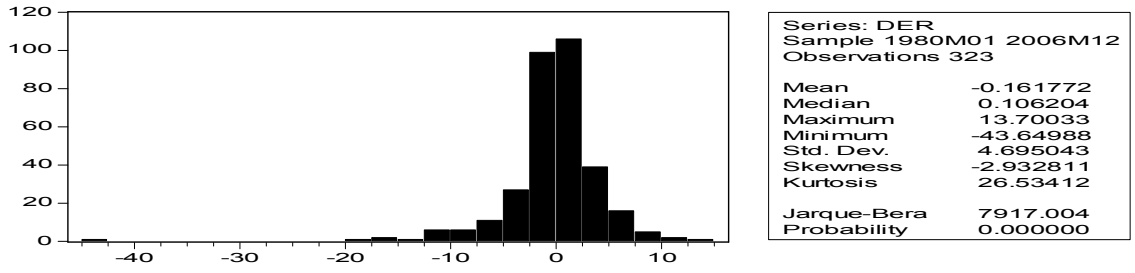


Figure2a.4 Histogram of the DER



Histograms postulate that real effective exchange rate and the difference of the series is not normal distributed.

Table 2a.3 :Augmented Dickey Fuller Test results of real effective exchange rate series both level and differenced series.

	ER		DER	
	t	p	t	p
None	-0.663223	0.4293	-17.56486	0.0000
constant	-2.152250	0.2245	-17.52704	0.0000
Con,trend	-2.001178	0.5980	-11.17069	0.0000

As shown from the Table 2a.3, Augmented Dickey Fuller Test results suggest differencing the ER series. For this reason, AR and GARCH models are estimated using differenced exchange rate data.

AR(1,3) MODEL OF REAL EFECTIVE EXCHANGE RATE INDEX

Table 2a.4: The Results of AR (1,3) Model of Real Effective Exchange Rate

DER	ARMA MODEL			
	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.080802	0.273662	-0.295261	0.7680
AR(1)	0.330293	0.052564	6.283674	0.0000
AR(3)	-0.096777	0.044559	-2.171885	0.0306
R-squared	0.124204	Mean Dep. V.	-0.064386	
Adjusted R^2-	0.118679	S.D.	3.996217	
S.E.	3.751596	Akaike info	5.491571	
Sum squar.resid	4461.608	Schwarz	5.526899	
Log likelihood	-875.6513	F-statistic	22.47832	
Durbin-Watson	1.908238	Prob(F-)	0.000000	
Inverted AR	.35+.37i	.35-.37i	-.37	

*S.E: S.E of the regression, Mean Dep. V: Mean Dependent Variable,

Figure2a.5-QStatistic Probabilities for Residuals Obtained in AR (1,3) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|. |	.|. |	1	0.036	0.036	0.4176	
*|. |	*|. |	2	-0.072	-0.073	2.0909	
*|. |	*|. |	3	-0.087	-0.083	4.5783	0.032
.|. |	.|. |	4	0.014	0.015	4.6389	0.098
*|. |	*|. |	5	-0.092	-0.106	7.3892	0.060
.|. |	.|. |	6	-0.024	-0.023	7.5831	0.108
.|. |	.|. |	7	0.019	0.009	7.7072	0.173
*|. |	*|. |	8	-0.081	-0.107	9.8951	0.129
.|. |	.|. |	9	0.009	0.016	9.9210	0.193
.|. |	.|. |	10	0.003	-0.019	9.9240	0.270
.|. |	.|. |	11	0.048	0.028	10.691	0.297
*|. |	*|. |	12	-0.145	-0.146	17.695	0.060

Although Breusch-Godfrey serial correlation LM test and Q probabilities of the residuals indicate the remaining serial correlation problem in AR(1,3) Model at the %10 probabilities, the correlation coefficient of the constructed uncertainty variables calculated from alternative ARMA models in which serial correlation problem is solved are quite high as seen in table2a.8.(Serial correlation problems solved in AR (1,2,3) model rather AR(1,3) model. However, because of the high correlation coefficients of constructed uncertainty variables, AR(1,3) model is preferred to construct the uncertainty variable as in the case of GARCH modeling.).

Table 2a.6: Breusch-Godfrey Serial Correlation LM test

Breusch -Godfrey	F-statistic	Probability	Obs*R-squared	Probability
Lag 2	1.975835	0.140360	3.964657	0.137748
Lag 7	2.271266	0.028733	15.61109	0.028917
Lag 12	2.320770	0.007519	26.77415	0.008327

Figure 2a.7-Q-Statistic Probabilities for Squared Residuals Obtained in AR (1,3) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|** |	.|** |	1	0.238	0.238	18.301	
.|** |	.|** |	2	0.305	0.263	48.444	
.|* |	.|. |	3	0.115	-0.001	52.771	0.000
.|. |	*|. |	4	0.039	-0.070	53.276	0.000
.|. |	.|. |	5	0.003	-0.027	53.279	0.000
.|. |	.|. |	6	0.018	0.035	53.386	0.000
.|. |	.|. |	7	0.047	0.060	54.103	0.000
.|* |	.|. |	8	0.080	0.062	56.228	0.000
.|. |	.|. |	9	0.009	-0.054	56.254	0.000
.|. |	.|. |	10	0.021	-0.023	56.402	0.000
.|. |	.|. |	11	0.012	0.020	56.448	0.000
.|* |	.|* |	12	0.080	0.101	58.600	0.000

Squared residuals indicates the presence of the ARCH effect in the series.

Table 2a.7: The Results of the ARCH-LM test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	19.45972	0.000014	18.44991	0.000017
Lag 7	7.029923	0.000000	43.48433	0.000000
Lag 12	4.515636	0.000000	47.79605	0.000003

Figure2a.5- Histogram of the Residual

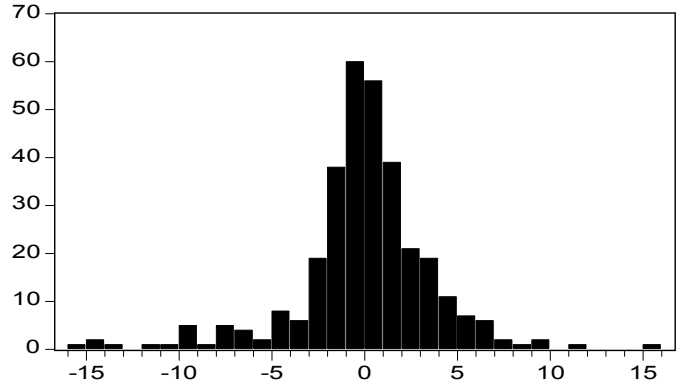


Table 2a.8: Correlations of the Uncertainty Variables Obtained from Alternative Model Specification

	SDTRESID13	SDTRESID1312	SDRESID1312	SDRESID13
SDTRESID13	1.000000	0.996313	0.990747	0.974672
SDTRESID1312	0.996313	1.000000	0.994171	0.991777
SDRESID1312	0.990747	0.994171	1.000000	0.995397
SDRESID13	0.974672	0.991777	0.995397	1.000000

Notes: SDTRESID13: residuals which is d-trended and modeled AR(1,3). SDTRESID1312: residuals which is d-trended and modeled AR (1,2,3). SDRESID1312: residuals which is differenced and modeled AR(1,2,3) SDRESID13: residuals which is differenced and modeled AR(1,3).

GARCH MODEL OF EXCHANGE RATE UNCERTAINTY

Table2a.9: The Results of the AR (1,3)-GARCH(1,1) Model of Real Effective Exchange Rate

DER	Mean Equation			
	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.006463	0.191493	-0.033750	0.9731
AR(1)	0.287257	0.064477	4.455196	0.0000
AR(3)	-0.152870	0.051561	-2.964839	0.0030
	Variance Equation			
C	3.251831	0.555520	5.853675	0.0000
RESID(-1)^2	0.364288	0.068808	5.294299	0.0000
GARCH(-1)	0.421560	0.066476	6.341498	0.0000
R-squared	0.117831	MDV	-0.064386	
Adjusted R-squared	0.103783	S.D. dep	3.996217	
S.E. of regression	3.783167	Akaike	5.287056	
Sum squared resid	4494.078	Schwarz	5.357712	
Log likelihood	-839.9290	F	8.388149	
Durbin-Watson stat	1.828011	Prob(F)	0.000000	
Inverted AR Roots	.37+.45i	.37-.45i	-.45	

Figure 2a.6- Q-Statistic Probabilities for Residuals Obtained from AR(1,3) GARCH(1,1) model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|. |	.|. |	1	0.052	0.052	0.8814	
.|. |	.|. |	2	-0.038	-0.040	1.3381	
.|. |	.|. |	3	-0.032	-0.027	1.6607	0.198
.|. |	.|. |	4	0.021	0.023	1.8112	0.404
*|. |	*|. |	5	-0.064	-0.070	3.1717	0.366
.|. |	.|. |	6	-0.012	-0.004	3.2183	0.522
.|. |	.|. |	7	0.044	0.042	3.8668	0.569
*|. |	*|. |	8	-0.074	-0.086	5.6969	0.458
.|. |	.|. |	9	0.017	0.033	5.7935	0.564
.|. |	.|. |	10	0.019	0.009	5.9093	0.657
.|. |	.|. |	11	0.017	0.008	6.0078	0.739
*|. |	*|. |	12	-0.139	-0.130	12.488	0.254

Figure2a.6 indicates that serial correlation problem is solved in mean equation.

Figure2a.7-Q-Statistic Probabilities for Squared Residuals Obtained from AR (1,3) GARCH(1,1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|. |	.|. |	1	0.015	0.015	0.0719	
.|. |	.|. |	2	-0.009	-0.009	0.0989	
.|. |	.|. |	3	-0.001	-0.001	0.0993	0.753
.|. |	.|. |	4	-0.017	-0.017	0.1954	0.907
.|. |	.|. |	5	-0.029	-0.029	0.4763	0.924
.|. |	.|. |	6	-0.051	-0.050	1.3268	0.857
.|. |	.|. |	7	0.056	0.057	2.3558	0.798
.|* |	.|* |	8	0.078	0.075	4.3602	0.628
.|. |	.|. |	9	0.038	0.037	4.8429	0.679
.|. |	.|. |	10	-0.008	-0.011	4.8663	0.772
.|. |	.|. |	11	-0.007	-0.007	4.8807	0.845
.|. |	.|. |	12	0.022	0.025	5.0430	0.888

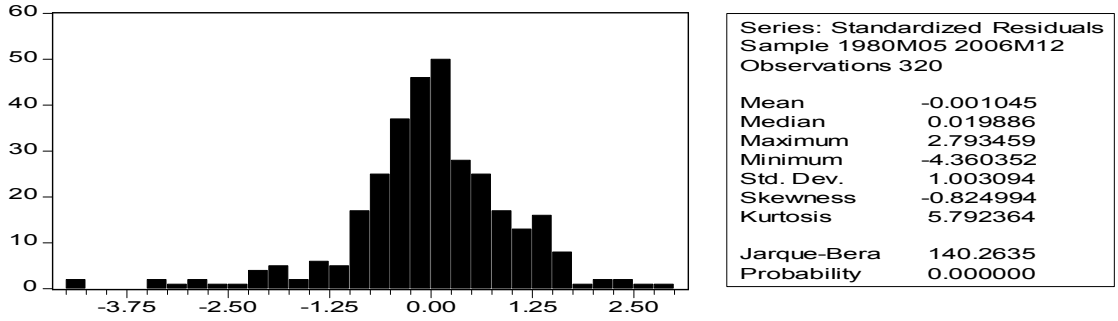
The Figure2a.7 indicates that there is no serial correlation problem in the variance equation. That means construction of the variance equation is true.

Table2a.10: ARCH LM Test Results

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.076863	0.781775	0.077329	0.780950
Lag 7	0.359169	0.925253	2.559034	0.922586
Lag 12	0.431513	0.950232	5.313090	0.946696

In addition to the Q statistic results, the results of the ARCH LM test postulate that arch effects are eliminated in the model.

Figure2a.8- Histogram of the Standardized Residuals



The Jarque - Bera test statistic rejects the hypothesis of normal distribution. However, when standardized residuals are not normally distributed, estimates are still consistent. In this case, Eviews offers using heteroskedasticity consistent covariance option to estimate standard error correctly to obtain valid inference. However because using this option do not change conditional variance series which are taken to construct uncertainty variable, this adjustment is not preferred. In addition to this, model is estimated using alternative algorithms such as Marquardt and Berndt-Hall-Hall-Hausman. Since change in variance series is found to be small, default setting of the Eviews, Marquardt algorithm, is preferred.

APPENDIX 3: THE RESULTS OF GARCH and ARMA PROCESS OF REAL WAGES IN INDUSTRIES

MANUFACTURE OF FOOD, BEVERAGE AND TOBACCO (ISIC REV3- 15)

15-FOOD PRODUCTS AND BEVERAGES

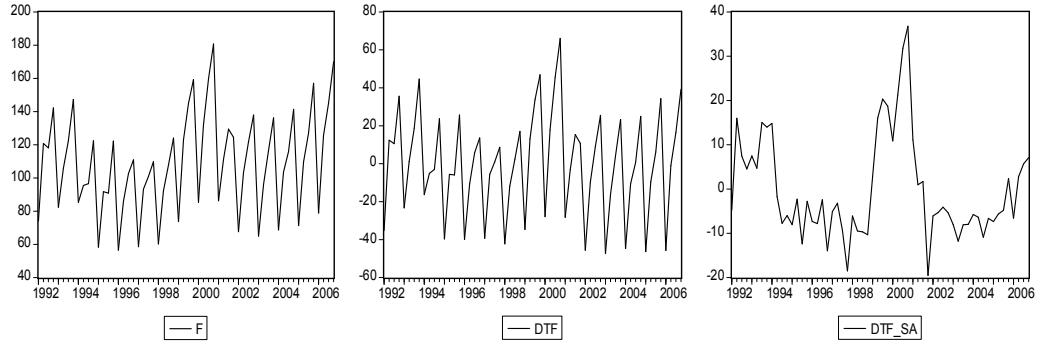


Table 3a.1 The Results of Augmented Dickey Fuller Test of the Real Wage Indexes in ISIC Rev.3

F			DTF		DTF_SA	
	t	p	t	p	t	p
None	-0.032245	0.6677	-2.921114	0.0042	-2.934779	0.0040
constant	-2.210079	0.2051	-2.905800	0.0511	-2.906941	0.0506
Con,trend	-2.752628	0.2207	-2.808648	0.2005	-2.908721	0.1673

Considering Augmented Dickey Fuller test results, 15 series are d-trended and seasonally adjusted.

AR MODEL OF ISIC Rev.3 15-FOOD PRODUCTS AND BEVERAGES

Table 3a.2: AR (1) Model of the D-trended and Seasonally Adjusted Series

Model2	B	se	p
ARMA			
C	0.572620	3.977328	0.8860
AR(1)	0.739890	0.089479	0.0000
R-squared	0.545361	MDV	-3.30E-06
Adjusted R-squared	0.537385	S.D. dependent var	11.65707
S.E. of regression	7.928649	Akaike info	7.012153
Sum squared resid	3583.218	Schwarz criterion	7.082578
Log likelihood	-204.8585	F-statistic	68.37428
Durbin-Watson stat	1.903857	Prob(F-statistic)	0.000000
Inverted AR Roots	.74		

Figure 3a.1- Q-Statistic Probabilities for Residuals Obtained from AR (1) model in 15

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	-0.008	-0.008	0.0040	
. | . |	. | . |	2	0.061	0.061	0.2424	0.622
. | . |	. | . |	3	0.011	0.012	0.2502	0.882
. | . |	. | . |	4	-0.031	-0.035	0.3136	0.957
. |*. |	. |*. |	5	0.165	0.164	2.1194	0.714
. | . |	. | . |	6	-0.026	-0.021	2.1654	0.826
. | . |	. | . |	7	0.048	0.029	2.3223	0.888
**| . |	**| . |	8	-0.233	-0.241	6.1495	0.522
. | . |	. | . |	9	-0.022	-0.015	6.1852	0.626
.*| . |	.*| . |	10	-0.144	-0.162	7.7066	0.564
.*| . |	.*| . |	11	-0.118	-0.106	8.7440	0.557
.*| . |	.*| . |	12	-0.084	-0.118	9.2800	0.596

Table 3a.3: Breusch -Godfrey LM Test

Breusch -Godfrey	F-statistic	Probability	Obs*R-squared	Probability
Lag 2	0.157867	0.854349	0.336763	0.845031
Lag 7	1.473252	0.198366	10.08830	0.183625
Lag 12	0.985713	0.476756	12.28054	0.423421

Serial correlation problem is solved.

Figure 3a.2- Q-Statistic Probabilities for Squared Residuals Obtained from AR (1) Model in 15

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.142	0.142	1.2580	
. | . |	.*| . |	2	-0.047	-0.069	1.3992	0.237
. |*. |	. |*. |	3	0.114	0.134	2.2318	0.328
. | . |	. | . |	4	0.045	0.003	2.3647	0.500
. |** |	. |** |	5	0.290	0.312	7.9688	0.093
. |*. |	. | . |	6	0.100	-0.006	8.6516	0.124
.*| . |	.*| . |	7	-0.132	-0.111	9.8548	0.131
.*| . |	.*| . |	8	-0.092	-0.144	10.448	0.165
.*| . |	.*| . |	9	-0.129	-0.163	11.650	0.168
. | . |	. | . |	10	0.026	-0.009	11.700	0.231
. | . |	.*| . |	11	-0.040	-0.081	11.823	0.297
.*| . |	. | . |	12	-0.163	-0.035	13.867	0.240

Table 3a.4: ARCH-LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	1.599276	0.211244	1.610402	0.204435
Lag 7	1.793355	0.112740	11.54272	0.116635
Lag 12	1.613027	17.05041	0.134383	0.147711

Considering the results of figure3a.2 and table3a.5, it can be claimed that the residuals do not have ARCH effects.

GARCH MODEL OF ISIC Rev.3 15-FOOD PRODUCTS AND BEVERAGES

Table 3a.5: The GARCH Model of the D-trended Real Wage Index of ISIC REV.3 15

DTF_SA	Model1	B	p
MODEL	GARCH		
Mean eq.			
	C	-3.46080	0.2710
	AR(1)	0.708271	0.0000
Variance eq			
GARCH(1,1)	C	6.641141	0.3896
	ARCH1	0.231999	0.2484
	GARCH1	0.643234	0.0021
R-squared	0.534427	MDV	-3.30E-06
Adjusted R-squared	0.499940	S.D. dependent	11.65707
S.E. of regression	8.243284	Akaike info	7.016539
Sum squared resid	3669.393	Schwarz criterion	7.192601
Log likelihood	-201.9879	F-statistic	15.49655
Durbin-Watson stat	1.797505	Prob(F-statistic)	0.000000
Inverted AR Roots	.71		

Figure 3a.3-Q-Statistic Probabilities for Residuals Obtained from AR (1)-GARCH (1,1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	-0.020	-0.020	0.0244	
. |*. |	. |*. |	2	0.133	0.133	1.1440	0.285
. | . |	. | . |	3	0.020	0.025	1.1687	0.557
. | . |	. | . |	4	0.038	0.022	1.2655	0.737
. |*. |	. |*. |	5	0.184	0.183	3.5221	0.475
.*| . |	.*| . |	6	-0.070	-0.074	3.8535	0.571
. | . |	. | . |	7	0.046	-0.005	4.0004	0.677
**| . |	**| . |	8	-0.193	-0.189	6.6188	0.470
. | . |	. | . |	9	-0.010	-0.035	6.6264	0.577
.*| . |	.*| . |	10	-0.173	-0.173	8.8283	0.453
.*| . |	.*| . |	11	-0.174	-0.165	11.099	0.350
.*| . |	.*| . |	12	-0.088	-0.071	11.691	0.387

Figure 3a.4-Q-Statistic Probabilities for Squared Residuals Obtained from AR (1)-GARCH(1,1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.128	0.128	1.0231	
**| . |	**| . |	2	-0.222	-0.243	4.1401	0.042
.*| . |	.*| . |	3	-0.156	-0.097	5.7043	0.058
. | . |	. | . |	4	0.038	0.024	5.8010	0.122
. |**** |	. |**** |	5	0.486	0.459	21.530	0.000
. |** |	. |*. |	6	0.231	0.149	25.141	0.000
**| . |	.*| . |	7	-0.211	-0.093	28.233	0.000
.*| . |	. | . |	8	-0.161	-0.004	30.055	0.000
. | . |	.*| . |	9	-0.054	-0.108	30.267	0.000
. |*. |	.*| . |	10	0.189	-0.067	32.881	0.000
. | . |	**| . |	11	0.034	-0.240	32.969	0.000
**| . |	**| . |	12	-0.252	-0.204	37.814	0.000
.*| . |	. |*. |	13	-0.074	0.071	38.248	0.000

Table 3a.6: ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	1.047399	0.310508	1.064889	0.302103
Lag 7	3.087895	0.009783	17.13006	0.016576
Lag 12	2.962597	0.006343	24.02411	0.020188

TEXTILE, WEARING APPAREL AND LEATHER INDUSTRIES (ISIC REV3-17/18/19)

17- TEXTILE INDUSTRY

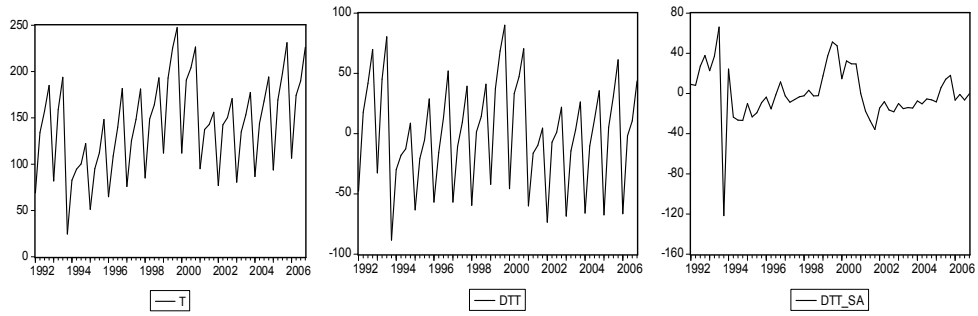


Table 3a. 7: The Results of the Augmented Dickey Fuller Test of the Real Wage Index of ISIC Rev3-17

T			DT		DT_SA	
	t	p	t	p	t	p
None	0.273774	0.7618	-2.225824	0.0263	-6.249608	0.0000
cons	-2.169362	0.2196	-2.213694	0.2039	-6.196049	0.0000
Con,trend	-3.513124	0.0482	-2.145633	0.5096	-6.167651	0.0000

Considering Augmented Dickey Fuller Test series are differenced and seasonally adjusted. Because d-trended model indicates negative R^2, differenced model is preferred.

AR MODEL IN 17- TEXTILE INDUSTRY

Table 3a.8 AR(1) Model of the Differenced Real Wage Index of ISIC Rev3-17

Model	B	se	p
ARMA			
C	0.972137	2.379636	0.6844
AR(1)	-0.573854	0.109555	0.0000
R-squared	0.328835	MDV	1.067600
Adjusted R-squared	0.316850	S.D. dependent var	34.50849
S.E. of regression	28.52226	Akaike info criterion	9.573121
Sum squared resid	45557.09	Schwarz criterion	9.644171
Log likelihood	-275.6205	F-statistic	27.43700
Durbin-Watson stat	2.308528	Prob(F-statistic)	0.000003
Inverted AR Roots	-.57		

Figure 3a.5 Q-Statistic Probabilities for Residuals Obtained from AR (1) model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.*| . |	.*| . |	1	-0.159	-0.159	1.5339	
.*| . |	**| . |	2	-0.164	-0.194	3.2090	0.073
. |** |	. |*. |	3	0.208	0.156	5.9543	0.051
.*| . |	. | . |	4	-0.062	-0.034	6.2021	0.102
.*| . |	.*| . |	5	-0.101	-0.061	6.8745	0.143
. |*. |	. | . |	6	0.084	0.014	7.3502	0.196
. | . |	. | . |	7	0.008	0.016	7.3551	0.289
.*| . |	.*| . |	8	-0.154	-0.122	9.0080	0.252
.*| . |	.*| . |	9	-0.102	-0.180	9.7432	0.284
. |*. |	. | . |	10	0.077	-0.014	10.174	0.337
. | . |	. | . |	11	0.008	0.034	10.178	0.425
.*| . |	. | . |	12	-0.085	-0.045	10.720	0.467

Table 3a.9- Breusch Godfrey Serial Correlation LM test

Breusch- Godfrey	F-statistic	Probability	Obs*R-squared	Probability
Lag 2	2.222158	0.118192	4.410529	0.110221
Lag 7	0.680895	0.687355	5.141578	0.642690
Lag 12	0.606380	0.824976	8.230671	0.766854

Although Breusch-Godfrey LM test indicates the serial correlation problem is solved jointly for lag 2, Lag7 and Lag12, Ljung-Box Q statistics reported in Figure 3a.5 indicates serial correlation problem with %10 significance level at second and third lag.

Figure 3a.6 Q-Statistic Probabilities for Squared Residuals Obtained from AR (1) model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|. |	.|. |	1	0.053	0.053	0.1687	
.|. |	.|. |	2	-0.000	-0.003	0.1687	0.681
.|. |	.|. |	3	0.001	0.001	0.1688	0.919
.|. |	.|. |	4	-0.022	-0.023	0.2013	0.977
.|. |	.|. |	5	-0.023	-0.021	0.2376	0.993
.|. |	.|. |	6	-0.014	-0.012	0.2516	0.998
.|. |	.|. |	7	-0.014	-0.013	0.2651	1.000
.|. |	.|. |	8	-0.008	-0.007	0.2698	1.000
.|. |	.|. |	9	-0.011	-0.011	0.2779	1.000
.|. |	.|. |	10	-0.017	-0.017	0.2988	1.000
.|. |	.|. |	11	-0.016	-0.015	0.3169	1.000
.|. |	.|. |	12	0.001	0.002	0.3170	1.000

Table 3a.10- ARCH-LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.519587	0.474071	0.533442	0.465164
Lag 7	0.443244	0.869216	3.432294	0.842344
Lag 12	1.256910	0.288931	14.42954	0.274123

GARCH MODEL OF ISIC Rev.3- 17 TEXTILE INDUSTRY

Table 3a. 11- The Estimation Results of the Differenced Real Wage Index of ISIC Rev3-17

DT_SA		B	p
MODEL	GARCH		
Mean eq.			
	C	0.025141	0.9909
	AR(1)	-0.383442	0.0000
Variance eq			
GARCH(1,1)	C	268.9372	0.0001
	ARCH1	1.088302	0.0000
	GARCH1	-0.180931	0.0045
R-squared	0.291092	M.D.V	1.067600
Adjusted R-squared	0.237590	S.D. dependent	34.50849
S.E. of regression	30.13147	Akaike info crite	8.969401
Sum squared resid	48118.99	Schwarz criterion	9.147025
Log likelihood	-255.1126	F-statistic	5.440719
Durbin-Watson stat	2.605085	Prob(F-statistic)	0.000957
Inverted AR Roots	-.38		

Figure 3a.7-Q-Statistics Probabilities of Residuals Obtained from AR(1)-GARCH(1,1) Model in 17

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.*| . |	.*| . |	1	-0.108	-0.108	0.7072	
**| . |	**| . |	2	-0.253	-0.268	4.6972	0.030
. |** |	. |*. |	3	0.232	0.184	8.1033	0.017
. | . |	.*| . |	4	-0.037	-0.066	8.1907	0.042
.*| . |	. | . |	5	-0.127	-0.036	9.2461	0.055
. |*. |	. |*. |	6	0.190	0.125	11.653	0.040
. | . |	. | . |	7	0.005	0.010	11.655	0.070
**| . |	.*| . |	8	-0.250	-0.170	15.992	0.025
.*| . |	.*| . |	9	-0.064	-0.181	16.281	0.039
. |*. |	. | . |	10	0.115	0.009	17.238	0.045

Figure 3a.8-Q-Statistics Probabilities of Squared Residuals Obtained from AR(1)-GARCH(1,1) Model in 17

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.095	0.095	0.5556	
. | . |	. | . |	2	-0.026	-0.035	0.5968	0.440
. | . |	. | . |	3	0.004	0.010	0.5979	0.742
. |*. |	. |*. |	4	0.074	0.073	0.9547	0.812
. | . |	. | . |	5	-0.008	-0.022	0.9588	0.916
. | . |	. | . |	6	-0.033	-0.026	1.0316	0.960
. | . |	. | . |	7	-0.043	-0.039	1.1561	0.979
. | . |	. | . |	8	-0.010	-0.009	1.1631	0.992
. | . |	. | . |	9	-0.033	-0.032	1.2421	0.996
.*| . |	.*| . |	10	-0.067	-0.058	1.5715	0.997
. | . |	. | . |	11	-0.039	-0.024	1.6832	0.998
. | . |	. | . |	12	-0.011	-0.009	1.6919	0.999

Table3a.12. ARCH-LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.519587	0.474071	0.533442	0.465164
Lag 7	0.443244	0.869216	3.432294	0.842344
Lag 12	1.256910	0.288931	14.42954	0.274123

Table3a.13. Correlation Matrix

	KKDTGARCH1	KKGARCH1	SSDTRESID1	SSRESID1
KKDTGARCH1	1.000000	0.716577	0.533802	0.536283
KKGARCH1	0.716577	1.000000	0.310254	0.331411
SSDTRESID1	0.533802	0.310254	1.000000	0.982994
SSRESID1	0.536283	0.331411	0.982994	1.000000

KKDTGARCH1 and KKGARCH1 represent the uncertainty variables computed from the d-trended and differenced series, respectively. SSDTRESID1 and SSRESID1 represent uncertainty variables computed from AR modeling with d-trended and differenced data.

18- WEARING APPAREL

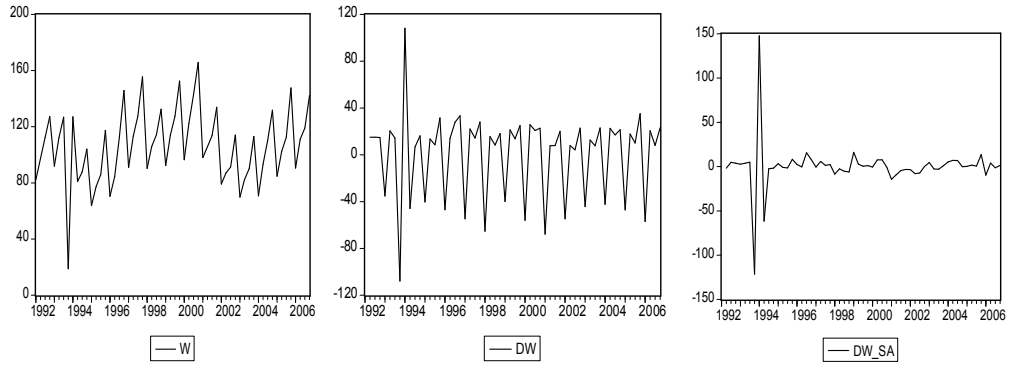


Table 3a.14- Augmented Dickey Fuller Test of Real Wage Index of Wearing Apparel

W			DW		DW_SA	
	t	p	t	p	t	p
None	-0.002490	0.6776	-3.966374	0.0002	-16.09700	0.0000
cons	-2.482221	0.1255	-3.928211	0.0035	-15.95918	0.0000
Con,trend	-2.699382	0.2411	-3.934728	0.0171	-15.81820	0.0000

AR MODEL OF THE ISIC REV3. 18- WEARING APPAREL

Table 3a.15- AR (1) Model of the Differenced Real Wage Index of ISIC-REV3-18

model	B		p
ARMA			
C	0.257488	1.692250	0.8796
AR(1)	-0.639488	0.102730	0.0000
R-squared	0.408970	M.D.V	0.278214
Adjusted R-squared	0.398415	S.D. dependent var	27.24193
S.E. of regression	21.12936	Akaike info	8.973078
Sum squared resid	25001.18	Schwarz criterion	9.044128
Log likelihood	-258.2193	F-statistic	38.74978
Durbin-Watson stat	2.491433	Prob(F-statistic)	0.000000
Inverted AR Roots	-.64		

Figure 3a.9-Q-Statistic Probabilities for Residuals Obtained from AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
**| . |	**| . |	1	-0.246	-0.246	3.6928	
**| . |	***| . |	2	-0.261	-0.343	7.9380	0.005
. |** |	. | . |	3	0.203	0.039	10.545	0.005
. | . |	. | . |	4	0.015	0.004	10.560	0.014
. | . |	. |*. |	5	-0.010	0.088	10.567	0.032
. | . |	. | . |	6	-0.006	0.014	10.569	0.061
. | . |	. | . |	7	-0.005	0.011	10.571	0.103
.*| . |	.*| . |	8	-0.101	-0.142	11.281	0.127
.*| . |	.*| . |	9	-0.067	-0.173	11.598	0.170
. |*. |	.*| . |	10	0.068	-0.079	11.934	0.217
. | . |	. | . |	11	-0.012	-0.037	11.945	0.289
. | . |	. | . |	12	-0.055	-0.016	12.174	0.351

Table 3a.16- Breusch Godfrey Serial Correlation LM Test

Breusch -Godfrey	F-statistic	Probability	Obs*R-squared	Probability
Lag 2	5.671297	0.005812	10.06802	0.006513
Lag 7	1.544494	0.174717	10.48402	0.162763
Lag 12	1.159470	0.340707	13.93439	0.304918

Figure 3a.9 and Table 3a.14 indicate high serial correlation problem. This problem is solved by adding AR(2) term into the equation. As mentioned before, because correlation between residuals obtained from alternative specifications are high, to construct the volatility as tractable way, AR(1) model is preferred.

Figure 3a.10-Q-Statistic Probabilities for Residuals Obtained from AR (1) model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |** |	. |** |	1	0.302	0.302	5.5586	
. | . |	. | . |	2	0.059	-0.035	5.7764	0.016
. | . |	. | . |	3	0.065	0.063	6.0439	0.049
. | . |	.*| . |	4	-0.051	-0.096	6.2093	0.102
. | . |	. | . |	5	-0.054	-0.011	6.4000	0.171
. | . |	. | . |	6	-0.028	-0.013	6.4542	0.265
. | . |	. | . |	7	-0.020	0.001	6.4806	0.372
. | . |	. | . |	8	-0.015	-0.010	6.4958	0.483
. | . |	. | . |	9	-0.012	-0.008	6.5055	0.591
. | . |	. | . |	10	-0.013	-0.011	6.5185	0.687
. | . |	. | . |	11	0.000	0.008	6.5185	0.770
. | . |	. | . |	12	-0.001	-0.005	6.5187	0.837

Table 3a.17- ARCH-LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	5.553621	0.022032	5.227704	0.022230
Lag 7	80.23674	0.000000	47.37315	0.000000
Lag 12	2.360556	0.025331	21.24731	0.046874

GARCH MODEL OF THE ISIC REV3. 18- WEARING APPAREL

Table 3a.18- GARCH Model of the Differenced Real Wage Index of ISIC-REV3-18

DW_SA		B	p
MODEL	GARCH		
Mean eq.			
	C	-4.937297	0.2694
	AR(1)	-0.127007	0.7125
Variance eq			
GARCH(1,1)	C	300.7063	0.1070
	ARCH1	1.080602	0.3225
	GARCH1	-0.091177	0.7727
R-squared	0.099054	Mean dependent var	0.278214
Adjusted R-squared	0.031058	S.D. dependent var	27.24193
S.E. of regression	26.81556	Akaike info	8.796977
Sum squared resid	38110.94	criterion	8.974601
Log likelihood	-250.1123	F-statistic	1.456758
Durbin-Watson stat	3.003603	Prob(F-statistic)	0.228465
Inverted AR Roots	-.13		

Figure 3a11- Q-Statistics Probabilities of Residuals of GARCH Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.*| . |	.*| . |	1	-0.116	-0.116	0.8241	
. | . |	. | . |	2	0.028	0.015	0.8738	0.350
. |*. |	. |*. |	3	0.160	0.168	2.5028	0.286
. | . |	. | . |	4	-0.044	-0.007	2.6284	0.453
. | . |	. | . |	5	-0.030	-0.048	2.6873	0.611
. | . |	. | . |	6	-0.019	-0.055	2.7104	0.745
. | . |	. | . |	7	-0.020	-0.017	2.7366	0.841
.*| . |	.*| . |	8	-0.147	-0.142	4.2428	0.751
.*| . |	.*| . |	9	-0.059	-0.087	4.4859	0.811
. | . |	. | . |	10	0.034	0.033	4.5695	0.870
.*| . |	.*| . |	11	-0.128	-0.075	5.7765	0.834
. | . |	. | . |	12	-0.026	-0.045	5.8278	0.885

Figure 3a.12- Q-Statistics Probabilities of Squared Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	0.014	0.014	0.0124	
. | . |	. | . |	2	-0.025	-0.025	0.0505	0.822
. | . |	. | . |	3	0.003	0.004	0.0512	0.975
. | . |	. | . |	4	-0.024	-0.025	0.0896	0.993
. | . |	. | . |	5	-0.027	-0.026	0.1358	0.998
. | . |	. | . |	6	-0.010	-0.010	0.1424	1.000
. | . |	. | . |	7	-0.010	-0.011	0.1499	1.000
. | . |	. | . |	8	0.007	0.007	0.1534	1.000
. | . |	. | . |	9	-0.009	-0.011	0.1589	1.000
. | . |	. | . |	10	-0.009	-0.010	0.1651	1.000
. | . |	. | . |	11	0.031	0.029	0.2341	1.000

Table 3a.19- ARCH-LM Test Results

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.011932	0.913414	0.012363	0.911465
Lag 7	0.984096	0.455334	7.042125	0.424507
Lag 12	1.575311	0.147561	16.75355	0.159106

Table 3a.20- Correlation Matrix

	KKDTGARCH1	KKGARCH1	SSDTRESID1	SSRESID1
KKDTGARCH1	1.000000	0.930453	0.486014	0.483293
KKGARCH1	0.930453	1.000000	0.400679	0.408331
SSDTRESID1	0.486014	0.400679	1.000000	0.974021
SSRESID1	0.483293	0.408331	0.974021	1.000000

19- DRESSING OF LEATHER

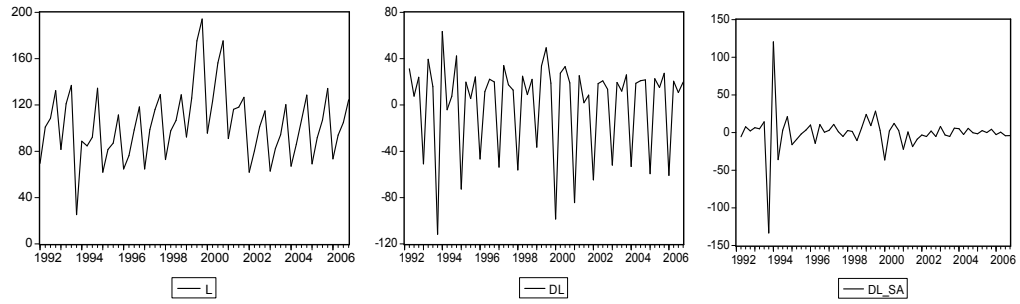


Table 3a.21-The Results of Augmented Dickey Fuller Test

L			DL		DL_SA	
	t	p	t	p	t	p
None	-0.352560	0.5535	-3.986002	0.0002	-14.17036	0.0000
cons	-1.717812	0.4169	-3.947146	0.0033	-14.04568	0.0000
Con,trend	-1.719591	0.7294	-3.905512	0.0184	-13.92495	0.0000

AR MODELLING OF 1ISIC REV3.1 9- DRESSING OF LEATHER

Table 3a.22- AR (1) Model of the Differenced Real Wage Index of ISIC Rev3-19

model	B	SE	P
ARMA			
C	-0.062268	1.862498	0.9734
AR(1)	-0.557617	0.110897	0.0000
R-squared	0.311053	MDV	-0.052681
Adjusted R-squared	0.298750	S.D. dependent var	26.38360
S.E. of regression	22.09380	Akaike info	9.062345
Sum squared resid	27335.61	Schwarz criterion	9.133395
Log likelihood	-260.8080	F-statistic	25.28347
Durbin-Watson stat	2.310674	Prob(F-statistic)	0.000005
Inverted AR Roots	-.56		

Figure 3a.13-Q-Statistic Probabilities for Residuals Obtained from AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.*| . |	.*| . |	1	-0.157	-0.157	1.5107	
.*| . |	**| . |	2	-0.186	-0.216	3.6613	0.056
. |*. |	. | . |	3	0.110	0.043	4.4236	0.110
.*| . |	.*| . |	4	-0.148	-0.173	5.8404	0.120
. | . |	. | . |	5	-0.004	-0.031	5.8416	0.211
. |*. |	. | . |	6	0.110	0.038	6.6468	0.248
. | . |	. |*. |	7	0.051	0.101	6.8265	0.337

.*| . |	. | . |	8	-0.064	-0.031	7.1104	0.417
.*| . |	.*| . |	9	-0.092	-0.098	7.7116	0.462
. | . |	. | . |	10	0.038	0.000	7.8177	0.553
.*| . |	.*| . |	11	-0.065	-0.077	8.1292	0.616
. | . |	.*| . |	12	-0.036	-0.070	8.2259	0.693

Table 3a.22- Breusch -Godfrey Serial Correlation LM Test

Breusch -Godfrey	F-statistic	Probability	Obs*R-squared	Probability
Lag 2	2.340960	0.105929	4.627513	0.098889
Lag 7	0.910958	0.505999	6.678781	0.463073
Lag 12	0.584435	0.842733	7.973749	0.787178

Figure 3a.14-Q-Statistic Probabilities for Squared Residuals Obtained from AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.123	0.123	0.9310	
. | . |	. | . |	2	0.033	0.018	0.9990	0.318
. | . |	. | . |	3	-0.021	-0.027	1.0262	0.599
. | . |	. | . |	4	-0.011	-0.006	1.0340	0.793
. | . |	. | . |	5	-0.049	-0.046	1.1918	0.879
. | . |	. | . |	6	-0.004	0.008	1.1928	0.946
. | . |	. | . |	7	-0.020	-0.018	1.2198	0.976
. | . |	. | . |	8	-0.022	-0.020	1.2535	0.990
. | . |	. | . |	9	-0.016	-0.011	1.2718	0.996
. | . |	. | . |	10	-0.022	-0.021	1.3076	0.998
. | . |	. | . |	11	-0.027	-0.023	1.3624	0.999
. | . |	. | . |	12	-0.026	-0.022	1.4150	1.000

Table 3a.23-ARCH- LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.864377	0.356580	0.881948	0.347669
Lag 7	4.040613	0.001756	20.23586	0.005082
Lag 12	2.992952	0.006235	23.97300	0.020514

GARCH MODELING OF ISIC REV3.1 9- DRESSING OF LEATHER

Table 3a.22- The Results of ARMA(5,5)-GARCH(1,1) Model of Differenced Real Wage Index of ISIC Rev3. 19

DL_SA		B	p
MODEL	GARCH		
Mean eq.			
	C	-0.416515	0.6916
	AR(5)	-0.566593	0.0000
	MA(5)	0.580935	0.0000
Variance eq.			
GARCH(1,1)	C	8.079584	0.1841
	ARCH1	0.460834	0.0445
	GARCH1	0.471788	0.0012
R-squared	0.343535	M. D. V	-0.452771
Adjusted R-squared	0.275153	S.D. dependent	27.31188
S.E. of regression	23.25277	Akaike info	7.892353
Sum squared resid	25953.18	Schwarz criterion	8.113351
Log likelihood	-207.0935	F-statistic	5.023785
Durbin-Watson stat	3.027292	Prob(F-statistic)	0.000882
Inverted AR Roots	.72-.52i	.72+.52i	-.28+.85i
	-.89		
Inverted MA Roots	.73-.53i	.73+.53i	-.28+.85i
	-.90		

Table 3a.15-Q-Statistics Probabilities of Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.*| . |	.*| . |	1	-0.096	-0.096	0.5236	
. | . |	. | . |	2	-0.045	-0.055	0.6406	
. |*. |	. |*. |	3	0.111	0.102	1.3654	0.243
.*| . |	.*| . |	4	-0.136	-0.121	2.4920	0.288
. | . |	. | . |	5	-0.025	-0.039	2.5291	0.470
. |*. |	. |*. |	6	0.101	0.076	3.1713	0.530
. |*. |	. |*. |	7	0.083	0.127	3.6167	0.606
.*| . |	.*| . |	8	-0.152	-0.145	5.1263	0.528
. | . |	.*| . |	9	-0.034	-0.083	5.2036	0.635
. |*. |	. |*. |	10	0.099	0.094	5.8781	0.661
.*| . |	.*| . |	11	-0.184	-0.119	8.2506	0.509

Figure 3a. 16- Q-Statistics Probabilities of Squared Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.*| . |	.*| . |	1	-0.137	-0.137	1.0632	
. |** |	. |** |	2	0.326	0.313	7.2379	
**| . |	.*| . |	3	-0.203	-0.146	9.6696	0.002
. |** |	. |*. |	4	0.257	0.150	13.678	0.001
. | . |	. |*. |	5	-0.043	0.096	13.792	0.003
. |*. |	. |*. |	6	0.196	0.067	16.223	0.003
.*| . |	. | . |	7	-0.106	-0.051	16.950	0.005
. | . |	.*| . |	8	-0.001	-0.122	16.950	0.009
.*| . |	. | . |	9	-0.060	-0.003	17.194	0.016
. | . |	.*| . |	10	-0.037	-0.090	17.287	0.027
. | . |	.*| . |	11	-0.057	-0.068	17.517	0.041
.*| . |	. | . |	12	-0.081	-0.057	17.993	0.055

Table 3a.23- ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.963828	0.330859	0.983047	0.321448
Lag 7	2.085729	0.068278	12.80230	0.077074
Lag 12	1.075369	0.414475	12.93386	0.373867

Table 3a.24- Correlation Matrix

	SSDTRESID1	SSRESID1	SSRESID15	KKDTGARCH1	KKGARCH1	KKGARCH15
SSDTRESID1	1.000000	0.981007	0.852536	0.564892	0.525466	0.764929
SSRESID1	0.981007	1.000000	0.884211	0.551950	0.528675	0.770958
SSRESID15	0.852536	0.884211	1.000000	0.662889	0.607640	0.824166
KKDTGARCH1	0.564892	0.551950	0.662889	1.000000	0.954936	0.866227
KKGARCH1	0.525466	0.528675	0.607640	0.954936	1.000000	0.854940
KKGARCH15	0.764929	0.770958	0.824166	0.866227	0.854940	1.000000

KKGARCH15 represents the ARMA(1,5)-GARCH(1,1) model with differenced data. SSRESID15 represent ARMA(1,5) model with differenced data.

MANUFACTURE OF PAPER AND PAPER PRODUCTS, PRINTING AND PUBLISHING (ISIC REV3- 21/22)

21- MANUFACTURE OF PAPER AND PAPER PRODUCT

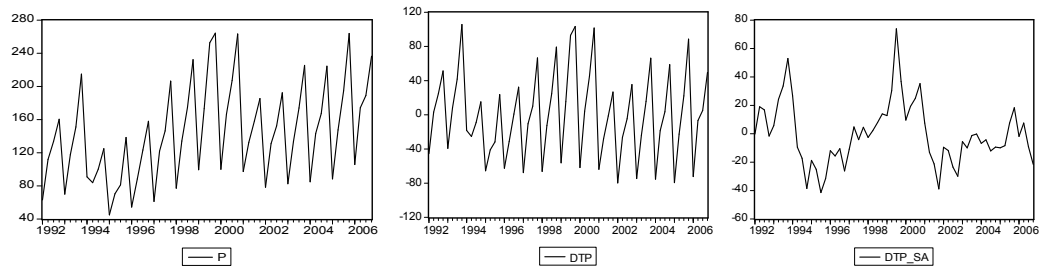


Table 3a.25-Augmented Dickey Fuller Test Result of the Real Wage Index in Paper Industry

P			DTP		DTP_SA	
	t	p	t	p	t	p
None	-0.149485	0.6276	-3.023935	0.0031	-2.939503	0.0039
cons	-2.108680	0.2422	-3.001733	0.0409	-2.914179	0.0497
Con,trend	-2.674436	0.2509	-3.007363	0.1396	-2.946047	0.1562

AR MODEL OF ISIC REV.3 -21 PAPER AND PAPER PRODUCT

Table 3a.26- AR (1) Model of D-trended Real Wage Index of ISIC Rev3-21

model	B	se	p
ARMA			
C	-1.282659	7.534267	0.8654
AR(1)	0.732759	0.091704	0.0000
R-squared	0.528333	Mean dependent	-0.286370
Adjusted R-squared	0.520058	S.D. dependent var	22.28138
S.E. of regression	15.43606	Akaike info criteri	8.344600
Sum squared resid	13581.50	Schwarz criterion	8.415025
Log likelihood	-244.1657	F-statistic	63.84793
Durbin-Watson stat	1.734683	Prob(F-statistic)	0.000000
Inverted AR Roots	.73		

Figure 3a.17- Q-Statistic Probabilities for Residuals Obtained from AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.096	0.096	0.5659	
.*| . |	.*| . |	2	-0.128	-0.138	1.5992	0.206
. | . |	. | . |	3	-0.025	0.002	1.6389	0.441
. | . |	. | . |	4	-0.038	-0.055	1.7330	0.630
. |** |	. |** |	5	0.216	0.230	4.8559	0.302
. | . |	. | . |	6	0.038	-0.028	4.9521	0.422
.*| . |	.*| . |	7	-0.150	-0.099	6.5160	0.368
.*| . |	.*| . |	8	-0.145	-0.131	7.9943	0.333
.*| . |	.*| . |	9	-0.105	-0.091	8.7905	0.360
. | . |	.*| . |	10	0.002	-0.059	8.7908	0.457
. | . |	. | . |	11	-0.000	-0.037	8.7908	0.552
.*| . |	.*| . |	12	-0.181	-0.160	11.288	0.419

Table 3a.27- Breusch -Godfrey LM Test

Breusch -Godfrey	F-statistic	Probability	Obs*R-squared	Probability
Lag 2	0.883336	0.419184	1.836177	0.399282
Lag 7	1.081236	0.389337	7.756836	0.354524
Lag 12	0.755657	0.690638	9.895062	0.625166

Figure 3a.18- Q-Statistic Probabilities for Squared Residuals Obtained from AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.102	0.102	0.6410	
. |*. |	. |*. |	2	0.097	0.088	1.2411	0.265
. | . |	. | . |	3	-0.037	-0.056	1.3304	0.514
. | . |	. | . |	4	-0.022	-0.022	1.3607	0.715
. | . |	. | . |	5	-0.010	0.003	1.3677	0.850
. | . |	. | . |	6	-0.023	-0.021	1.4041	0.924
. | . |	. | . |	7	-0.021	-0.018	1.4339	0.964
.*| . |	.*| . |	8	-0.072	-0.066	1.7959	0.970
. | . |	. | . |	9	0.028	0.044	1.8513	0.985
. | . |	. | . |	10	0.003	0.007	1.8518	0.994
.*| . |	.*| . |	11	-0.076	-0.094	2.2846	0.994
.*| . |	.*| . |	12	-0.099	-0.087	3.0322	0.990

Table 3a.28- ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.586887	0.446843	0.601543	0.437990
Lag 7	0.128637	0.995723	1.042838	0.994108
Lag 12	0.189723	0.998102	2.949662	0.995889

GARCH MODEL OF ISIC REV.3 21 PAPER AND PAPER PRODUCT

Table 3a.29-The Results of the AR(1)-GARCH(1,1) Model of D-trended Real Wage Index of ISIC Rev3- 21

DTP_SA		B	p
MEL	GARCH		
Mean eq.			
	C	-3.296815	0.6674
	AR(1)	0.725087	0.0000
Variance eq			
GARCH(1,1)	C	56.68195	0.3143
	ARCH1	0.508479	0.0138
	GARCH1	0.317055	0.3855
R-squared	0.527623	Mean dependent	-0.286370
Adjusted R-squared	0.492632	S.D. dependent	22.28138
S.E. of regression	15.87098	Akaike info	8.362420
Sum squared resid	13601.95	Schwarz criterion	8.538482
Log likelihood	-241.6914	F-statistic	15.07885
Durbin-Watson stat	1.719353	Prob(F-statistic)	0.000000
Inverted AR Roots	.73		

Figure 3a.19- Q-Statistics Probabilities of Residuals Obtained from GARCH Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.141	0.141	1.2265	
. | . |	.*| . |	2	-0.055	-0.076	1.4182	0.234
. | . |	. | . |	3	0.035	0.056	1.4973	0.473
. | . |	. | . |	4	-0.035	-0.055	1.5786	0.664
. |** |	. |** |	5	0.211	0.239	4.5503	0.337
. | . |	. | . |	6	0.045	-0.040	4.6866	0.455
.*| . |	.*| . |	7	-0.172	-0.144	6.7308	0.346
.*| . |	.*| . |	8	-0.106	-0.089	7.5223	0.377
.*| . |	.*| . |	9	-0.088	-0.061	8.0802	0.426
.*| . |	.*| . |	10	-0.077	-0.105	8.5136	0.483
. | . |	. | . |	11	-0.008	-0.006	8.5183	0.578
**| . |	.*| . |	12	-0.220	-0.186	12.218	0.347

Figure 3a.20- Q Statistics Probabilities of Squared Residuals Obtained from GARCH

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.082	0.082	0.4181	
. | . |	. | . |	2	-0.007	-0.014	0.4214	0.516
.*| . |	.*| . |	3	-0.120	-0.119	1.3494	0.509
. | . |	. | . |	4	-0.039	-0.020	1.4488	0.694
. | . |	. | . |	5	-0.002	0.001	1.4490	0.836
. | . |	. | . |	6	-0.036	-0.052	1.5387	0.909
. | . |	. | . |	7	-0.048	-0.050	1.7009	0.945
.*| . |	. | . |	8	-0.061	-0.056	1.9651	0.962
. | . |	. | . |	9	0.054	0.053	2.1715	0.975
. |*. |	. |*. |	10	0.101	0.081	2.9270	0.967
. | . |	. | . |	11	0.001	-0.031	2.9270	0.983

Table 3a.30-ARCH- LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.380697	0.539731	0.391631	0.531443
Lag 7	0.212865	0.980635	1.703291	0.974427
Lag 12	0.421717	0.943968	6.089218	0.911518

Table 3a.31-Correlation Matrix of the Uncertainty Proxies Obtained from Alternative Specification

	KKDTGARCH1	KKGARCH1	SSDTRESID1	SSRESID1
KKDTGARCH1	1.000000	0.835227	0.517180	0.441213
KKGARCH1	0.835227	1.000000	0.514850	0.470802
SSDTRESID1	0.517180	0.514850	1.000000	0.913761
SSRESID1	0.441213	0.470802	0.913761	1.000000

KKDTGARCH1 and SSDTRESID1 show the GARCH and AR uncertainty proxies calculated from the AR(1)-GARCH(1,1) and AR(1) model of the d-trended series, respectively. KKGARCH1 and SSRESID1 show the GARCH and AR uncertainty proxies calculated from the AR(1)-GARCH(1,1) and AR(1) model of differenced series.

22- PUBLISHING AND PRINTING

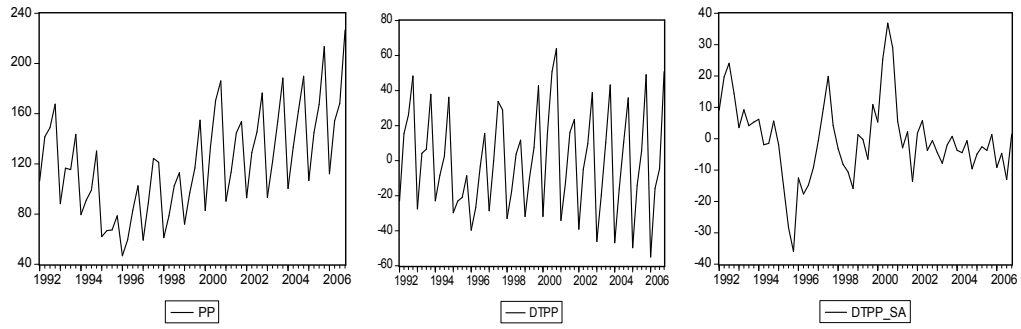


Table 3a.32- Augmented Dickey Fuller Test Results of Real Wage Index in Publishing and Printing Sector

PP			DTPP		DTPP_SA	
	t	p	t	p	t	p
None	0.235487	0.7509	-3.633255	0.0005	-3.182294	0.0019
cons	-1.101010	0.7093	-3.630444	0.0081	-3.158216	0.0277
Con,trend	-3.124124	0.1111	-3.581013	0.0408	-3.126525	0.1098

AR MODEL OF ISIC REV.3 22- PUBLISHING AND PRINTING

Table 3a.33- AR (1) Model of the D-trended Real Wage Index of ISIC Rev3-22

model	B	se	p
ARMA			
C	-0.680442	3.991412	0.8652
AR(1)	0.706780	0.092844	0.0000
R-squared	0.504139	Mean dependent	-0.368691
Adjusted R-squared	0.495440	S.D. dependent var	12.64805
S.E. of regression	8.984211	Akaike info	7.262125
Sum squared resid	4600.815	Schwarz criterion	7.332550
Log likelihood	-212.2327	F-statistic	57.95162
Durbin-Watson stat	1.820778	Prob(F-statistic)	0.000000
Inverted AR Roots	.71		

Figure 3a.21-Q-statistic probabilities for residuals obtained in AR (1) model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.079	0.079	0.3915	
. | . |	. | . |	2	-0.032	-0.039	0.4575	0.499
. | . |	. | . |	3	0.041	0.047	0.5645	0.754
.*| . |	**| . |	4	-0.184	-0.194	2.7781	0.427
.*| . |	. | . |	5	-0.078	-0.043	3.1850	0.527
. |*. |	. |*. |	6	0.071	0.066	3.5232	0.620
.*| . |	.*| . |	7	-0.117	-0.121	4.4695	0.613
**| . |	**| . |	8	-0.276	-0.298	9.8442	0.198
. |*. |	. |*. |	9	0.076	0.095	10.260	0.247
. | . |	. | . |	10	0.036	0.048	10.356	0.322
. | . |	. | . |	11	-0.023	-0.057	10.397	0.406

Table 3a. 34- Breusch -Godfrey LM Test

Breusch -Godfrey serial cor. LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 2	0.227980	0.796888	0.485100	0.784625
Lag 7	0.448016	0.866806	3.482198	0.837107
Lag 12	1.254305	0.278390	14.78806	0.253232

Figure 3a.22-Q Statistics Probabilities of Squared Residuals Obtained from GARCH Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |** |	. |** |	1	0.322	0.322	6.4377	
. |*. |	. |*. |	2	0.167	0.070	8.1906	0.004
. |** |	. |*. |	3	0.224	0.170	11.414	0.003
**| . |	***| . |	4	-0.238	-0.416	15.124	0.002
. | . |	. |** |	5	0.025	0.266	15.167	0.004
. |*. |	. |*. |	6	0.154	0.100	16.778	0.005
.*| . |	.*| . |	7	-0.126	-0.135	17.870	0.007
.*| . |	**| . |	8	-0.063	-0.247	18.146	0.011
.*| . |	. | . |	9	-0.110	0.019	19.019	0.015
**| . |	. | . |	10	-0.244	0.003	23.401	0.005
.*| . |	. | . |	11	-0.060	-0.011	23.668	0.009

Table 3a.34- ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	6.674526	0.012417	6.176712	0.012944
Lag 7	4.006663	0.001803	20.24279	0.005068
Lag 12	2.344851	0.025475	21.28314	0.046385

GARCH MODEL OF ISIC REV.3 22- PUBLISHING AND PRINTING

Table 3a.35- The Results of The GARCH Model of D-trended Real Wage Index of ISIC Rev3-22

DTP_SA		B	p
MODEL	GARCH		
Mean eq.			
	C	-1.775320	0.5514
	AR(1)	0.652368	0.0000
Variance eq			
GARCH(1,1)	C		
	ARCH1	0.430172	0.2955
	GARCH1	0.392593	0.2239
R-squared	0.500110	Mean dependent var	-0.368691
Adjusted R-squared	0.463081	S.D. dependent var	12.64805
S.E. of regression	9.267823	Akaike info criterion	7.252926
Sum squared resid	4638.197	Schwarz criterion	7.428989
Log likelihood	-208.9613	F-statistic	13.50596
Durbin-Watson stat	1.715153	Prob(F-statistic)	0.000000
Inverted AR Roots	.65		

Figure 3a.23- Q-Statistics Probabilities of Residuals of GARCH Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|. |	.|. |	1	0.048	0.048	0.1407	
.|. |	.|. |	2	0.025	0.022	0.1792	0.672
.|*. |	.|*. |	3	0.073	0.071	0.5254	0.769
.*|. |	.*|. |	4	-0.174	-0.182	2.4975	0.476
.*|. |	.|. |	5	-0.067	-0.054	2.7965	0.592
.|. |	.|. |	6	-0.047	-0.040	2.9465	0.708
.*|. |	.*|. |	7	-0.137	-0.108	4.2466	0.643
**|. |	***|. |	8	-0.308	-0.336	10.940	0.141
.|*. |	.|*. |	9	0.070	0.089	11.293	0.186
.|*. |	.|*. |	10	0.092	0.113	11.917	0.218
.|. |	.|. |	11	-0.010	-0.034	11.924	0.290
.|*. |	.|. |	12	0.151	-0.000	13.663	0.252

Figure 3a.24-Q-Statistics Probabilities of Squared Residuals of GARCH Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|. |	.|. |	1	0.016	0.016	0.0155	
.|*. |	.|*. |	2	0.105	0.105	0.7181	0.397
.|. |	.|. |	3	0.020	0.017	0.7441	0.689
**|. |	**|. |	4	-0.211	-0.225	3.6644	0.300
.|. |	.|. |	5	-0.012	-0.011	3.6744	0.452
.|*. |	.|** |	6	0.190	0.256	6.1172	0.295
.*|. |	.*|. |	7	-0.107	-0.117	6.9137	0.329
.|. |	.*|. |	8	0.024	-0.099	6.9547	0.434
.|. |	.|. |	9	-0.014	0.018	6.9698	0.540

.*| . |	.*| . |	10	-0.178	-0.070	9.3070	0.409
. | . |	. | . |	11	0.027	-0.017	9.3607	0.498
. | . |	. | . |	12	0.037	0.023	9.4678	0.579

Table 3a.36- The Results of the ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.024542	0.876078	0.025407	0.873357
Lag 7	1.235415	0.304407	8.541479	0.287272
Lag 12	0.643697	0.790109	8.701034	0.728232

Table 3a. 37- Correlation Matrix

	KKDTGARCH1	KKGARCH1	SSDTRESID1	SSRESID1
KKDTGARCH1	1.000000	-0.591590	0.516675	0.423708
KKGARCH1	-0.591590	1.000000	-0.270859	-0.260527
SSDTRESID1	0.516675	-0.270859	1.000000	0.967078
SSRESID1	0.423708	-0.260527	0.967078	1.000000

MANUFACTURE OF CHEMICALS AND OF CHEMICAL PETROLEUM, RUBBER AND PLASTIC PRODUCTS (ISIC REV3- 23/24/25)

23- MANUFACTURE OF COKE, REFINED PETROLEUM

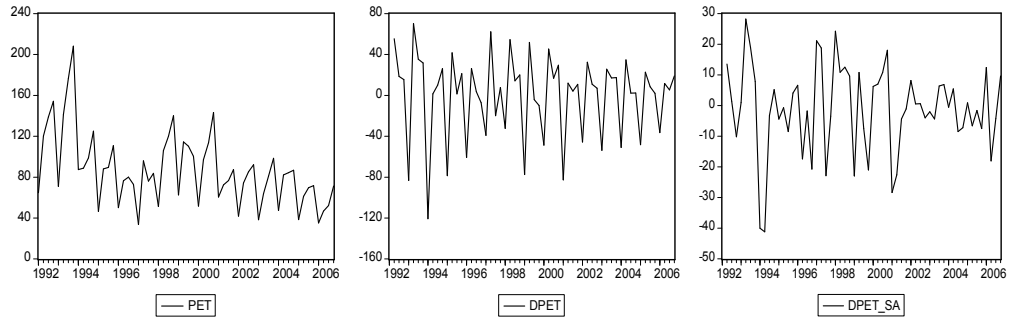


Table 3a.38-Augmented Dickey Fuller Test Results of the Real Wage Index for Manufacture of Coke, Refined Petroleum

PET			DTPET		DTPET_SA	
	t	p	t	p	t	p
None	-1.717440	0.0813	-3.870823	0.0002	-3.273699	0.0015
cons	-3.233117	0.0237	-3.844108	0.0046	-3.247450	0.0221
Con,trend	-3.969773	0.0160	-3.850267	0.0217	-3.263490	0.0825

AR MODEL of ISIC Rev.3 23- COKE, REFINED PETROLEUM

Table3a.39- AR(1) Model of D-trended Real Wage Index of ISIC Rev3-23

model			
ARMA			
C	0.603527	5.279488	0.9094
AR(1)	0.689473	0.095622	0.0000
R-squared	0.477016	Mean dependent var	0.445857
Adjusted R-squared	0.467841	S.D. dependent var	17.26069
S.E. of regression	12.59155	Akaike info criterion	7.937239
Sum squared resid	9037.182	Schwarz criterion	8.007664
Log likelihood	-232.1485	F-statistic	51.98993
Durbin-Watson stat	1.489219	Prob(F-statistic)	0.000000
Inverted AR Roots	.69		

Figure 3a.25-Q-Statistic Probabilities for Residuals Obtained from AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |** |	. |** |	1	0.254	0.254	4.0019	
.*| . |	**| . |	2	-0.126	-0.203	4.9998	0.025
.*| . |	.*| . |	3	-0.182	-0.102	7.1249	0.028
**| . |	**| . |	4	-0.228	-0.194	10.528	0.015
. |*. |	. |*. |	5	0.080	0.172	10.959	0.027
. |*. |	. | . |	6	0.126	-0.022	12.042	0.034
.*| . |	**| . |	7	-0.186	-0.274	14.443	0.025
. | . |	. |** |	8	0.056	0.236	14.667	0.041
. |*. |	. |*. |	9	0.131	0.076	15.899	0.044
.*| . |	**| . |	10	-0.078	-0.213	16.349	0.060
.*| . |	.*| . |	11	-0.119	-0.154	17.413	0.066
**| . |	.*| . |	12	-0.259	-0.086	22.538	0.021

Table3a.40- Breusch -Godfrey Serial Correlation LM Test

Breusch -Godfrey	F-statistic	Probability	Obs*R-squared	Probability
Lag 2	4.248121	0.019249	7.894613	0.019307
Lag 7	2.209542	0.049001	13.93899	0.052277
Lag 12	2.000251	0.046859	20.52342	0.057810

Figure 3a.26-Q-Statistic Probabilities for Squared Residuals Obtained from AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*** |	. |*** |	1	0.392	0.392	9.5110	
. |** |	. |** |	2	0.327	0.205	16.244	0.000
. |*. |	. |. |	3	0.155	-0.033	17.787	0.000
. |. |	.*|. |	4	0.015	-0.113	17.801	0.000
.*|. |	.*|. |	5	-0.147	-0.181	19.236	0.001
**|. |	.*|. |	6	-0.189	-0.087	21.659	0.001
.*|. |	. |. |	7	-0.144	0.043	23.088	0.001
. |. |	. |*. |	8	-0.045	0.119	23.228	0.002
.*|. |	. |. |	9	-0.060	-0.039	23.486	0.003
. |. |	. |. |	10	0.053	0.039	23.693	0.005
.*|. |	**|. |	11	-0.114	-0.243	24.663	0.006
. |. |	. |*. |	12	0.052	0.106	24.867	0.010

Table3a.41- ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	10.64216	0.001885	9.262087	0.002339
Lag 7	1.970870	0.080960	12.41255	0.087783
Lag 12	1.234376	0.301048	14.26250	0.284261

GARCH MODEL OF ISIC REV.3 23- MANUFACTURE OF COKE, REFINED PETROLEUM

Table 3a.42- The results of the AR (1)-GARCH (1,1) Model of D-trended Real Wage Index of ISIC Rev3-23

DTPET_SA		B	p
MODEL	GARCH		
Mean eq.			
	C	-5.280394	0.1748
	AR(1)	0.678097	0.0000
Variance eq			
GARCH(1,1)	C	25.40912	0.2624
	ARCH1	0.893168	0.0380
	GARCH1	0.162711	0.4225
R-squared	0.464671	Mean dependent	0.445857
Adjusted R-squared	0.425017	S.D. dependent	17.26069
S.E. of regression	13.08838	Akaike info criterion	7.814543
Sum squared resid	9250.504	Schwarz criterion	7.990606
Log likelihood	-225.5290	F-statistic	11.71813
Durbin-Watson stat	1.440913	Prob(F-statistic)	0.000001
Inverted AR Roots	.68		

Table 3a.27- Q-Statistics Probabilities of Residuals of GARCH Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.153	0.153	1.4471	
. | . |	. | . |	2	-0.023	-0.048	1.4808	0.224
. | . |	. | . |	3	-0.039	-0.029	1.5787	0.454
**| . |	**| . |	4	-0.235	-0.232	5.1995	0.158
. |*. |	. |*. |	5	0.110	0.195	6.0097	0.198
. |*. |	. | . |	6	0.098	0.032	6.6598	0.247
.*| . |	**| . |	7	-0.156	-0.199	8.3507	0.214
. |*. |	. |*. |	8	0.067	0.096	8.6714	0.277
. | . |	. |*. |	9	0.044	0.100	8.8127	0.358
.*| . |	.*| . |	10	-0.131	-0.183	10.081	0.344
. | . |	.*| . |	11	-0.023	-0.089	10.122	0.430
.*| . |	.*| . |	12	-0.181	-0.073	12.628	0.318

Figure 3a.28- Q-Statistics Probabilities of Squared Residuals of GARCH Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	-0.050	-0.050	0.1577	
. |*. |	. |*. |	2	0.096	0.094	0.7381	0.390
.*| . |	.*| . |	3	-0.104	-0.096	1.4376	0.487
. | . |	. | . |	4	0.010	-0.007	1.4442	0.695
. | . |	. | . |	5	0.020	0.040	1.4711	0.832
.*| . |	.*| . |	6	-0.140	-0.152	2.8087	0.729
.*| . |	.*| . |	7	-0.070	-0.089	3.1483	0.790
. | . |	. | . |	8	-0.049	-0.022	3.3152	0.854
. | . |	. | . |	9	0.003	-0.019	3.3157	0.913
. | . |	. | . |	10	0.020	0.010	3.3462	0.949
.*| . |	.*| . |	11	-0.129	-0.132	4.5932	0.917
. |** |	. |*. |	12	0.211	0.192	8.0148	0.712

Table3a. 43- The Results of the ARCH-LM test in Manufacture of Coke and Refined Petroleum

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.123960	0.726100	0.128104	0.720406
Lag 7	1.508284	0.189559	10.06297	0.185033
Lag 12	1.898831	0.070611	18.85925	0.091982

Table 3a.44-Correlation Matrix

	SSDTRESID1	SSDTRESID12	KKDTGARCH1	KKDTGARCH12
SSDTRESID1	1.000000	0.921287	0.383850	0.353882
SSDTRESID12	0.921287	1.000000	0.394603	0.384722
KKDTGARCH1	0.383850	0.394603	1.000000	0.958547
KKDTGARCH12	0.353882	0.384722	0.958547	1.000000

SSDTRESID1 and KKDTGARCH1 indicate AR(1) and AR(1)-GARCH(1,1) model respectively.
SSDTRESID12 and KKGARCH12 indicate AR(1,2) and AR(1,2)- GARCH(1,1) representation.

24- MANUFACTURE OF CHEMICAL INDUSTRY

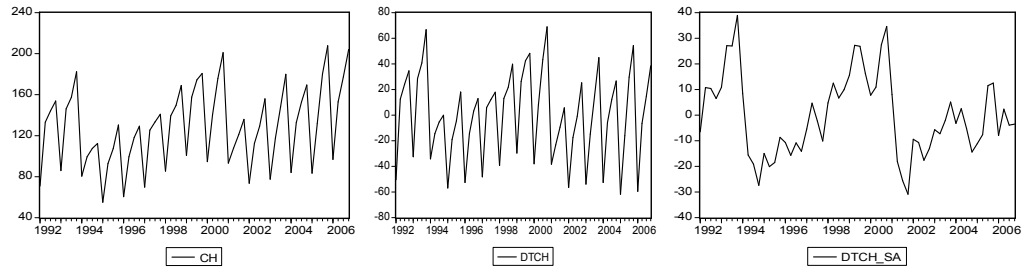


Table3a.45-Augmented Dickey Fuller Test Results of Real Wage Index in Chemical Industry

CH			DTCH		DTCH_SA	
	t	p	t	p	t	p
None	0.569802	0.8361	-3.839229	0.0003	-2.878275	0.0047
cons	-2.410093	0.1441	-3.889948	0.0041	-2.853173	0.0572
Con,trend	-4.125074	0.0106	-3.818844	0.0234	-2.882178	0.1756

AR MODEL OF ISIC REV3-24- CHEMICAL INDUSTRY

Table3a.46-AR(1) Model of D-trended Real Wage Index of ISIC Rev3-24

model	B	Se	P
ARMA			
C	0.098959	5.540069	0.9858
AR(1)	0.751085	0.087241	0.0000
R-squared	0.565282	Mean dependent var	-0.056768
Adjusted R-squared	0.557656	S.D. dependent var	15.92481
S.E. of regression	10.59143	Akaike info criterion	7.591278
Sum squared resid	6394.166	Schwarz criterion	7.661703
Log likelihood	-221.9427	F-statistic	74.11960
Durbin-Watson stat	1.522628	Prob(F-statistic)	0.000000
Inverted AR Roots	.75		

Figure 3a.29-Q-Statistic Probabilities for Residuals Obtained from AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|** |	.|** |	1	0.219	0.219	2.9745	
.*| . |	.*| . |	2	-0.122	-0.178	3.9117	0.048
.*| . |	.*| . |	3	-0.138	-0.073	5.1391	0.077
.*| . |	.*| . |	4	-0.134	-0.112	6.3071	0.098
.|*. |	.|** |	5	0.158	0.203	7.9657	0.093
.|*. |	.|. |	6	0.128	-0.001	9.0826	0.106
.*| . |	**| . |	7	-0.171	-0.204	11.117	0.085
.*| . |	.*| . |	8	-0.173	-0.063	13.223	0.067
.|. |	.|. |	9	-0.027	0.054	13.276	0.103

.*| . |	.*| . |	10	-0.062	-0.151	13.556	0.139
. | . |	.*| . |	11	-0.051	-0.126	13.754	0.185
**| . |	**| . |	12	-0.192	-0.190	16.580	0.121

Table3a.47- Breusch -Godfrey Serial Correlation LM Test

Breusch -Godfrey	F-statistic	Probability	Obs*R-squared	Probability
Lag 2	2.611503	0.082510	5.116938	0.077423
Lag 7	2.259092	0.044481	14.17647	0.048130
Lag 12	1.631066	0.116910	17.88361	0.119270

Figure 3a.30-Q-Statistic Probabilities for Squared Residuals Obtained from AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |** |	. |** |	1	0.303	0.303	5.7116	
. |** |	. |** |	2	0.299	0.227	11.338	0.001
. |*. |	. | . |	3	0.165	0.030	13.087	0.001
. | . |	.*| . |	4	0.047	-0.076	13.232	0.004
.*| . |	**| . |	5	-0.132	-0.202	14.391	0.006
.*| . |	. | . |	6	-0.103	-0.039	15.111	0.010
.*| . |	. | . |	7	-0.167	-0.055	17.032	0.009
. | . |	. |*. |	8	-0.036	0.111	17.122	0.017
**| . |	.*| . |	9	-0.216	-0.187	20.481	0.009
.*| . |	.*| . |	10	-0.139	-0.096	21.898	0.009
.*| . |	.*| . |	11	-0.153	-0.068	23.648	0.009

Table3a.48- ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	6.194134	0.015817	5.776425	0.016243
Lag 7	1.964342	0.081957	12.38123	0.088699
Lag 12	1.126062	0.372395	13.36692	0.342945

GARCH MODEL OF ISIC REV3-24- CHEMICAL INDUSTRY

Table3a. 49- The Results of the AR(1)-GARCH(1,1) Model of D-trended Real Wage Index of ISIC Rev3-24

DTCH_SA		B	p
MODEL	GARCH		
Mean eq.			
	C	1.644854	0.7929
	AR(1)	0.756585	0.0000
Variance eq			
GARCH(1,1)	C	43.27366	0.5501
	ARCH1	0.270747	0.4040
	GARCH1	0.310461	0.7261
R-squared	0.564688	Mean dependent var	-0.056768
Adjusted R-squared	0.532442	S.D. dependent var	15.92481
S.E. of regression	10.88910	Akaike info criterion	7.612407
Sum squared resid	6402.916	Schwarz criterion	7.788470
Log likelihood	-219.5660	F-statistic	17.51221
Durbin-Watson stat	1.528416	Prob(F-statistic)	0.000000
Inverted AR Roots	.76		

Figure 3a.31- Q-statistics probabilities of residuals of GARCH Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |** |	. |** |	1	0.219	0.219	2.9745	
.*| . |	.*| . |	2	-0.122	-0.178	3.9117	0.048
.*| . |	.*| . |	3	-0.138	-0.073	5.1391	0.077
.*| . |	.*| . |	4	-0.134	-0.112	6.3071	0.098
. |*. |	. |** |	5	0.158	0.203	7.9657	0.093
. |*. |	. | . |	6	0.128	-0.001	9.0826	0.106
.*| . |	**| . |	7	-0.171	-0.204	11.117	0.085
.*| . |	.*| . |	8	-0.173	-0.063	13.223	0.067
. | . |	. | . |	9	-0.027	0.054	13.276	0.103
.*| . |	.*| . |	10	-0.062	-0.151	13.556	0.139
. | . |	.*| . |	11	-0.051	-0.126	13.754	0.185
**| . |	**| . |	12	-0.192	-0.190	16.580	0.121

Figure 3a.32- Q-Statistics Probabilities of Squared Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |** |	. |** |	1	0.303	0.303	5.7116	
. |** |	. |** |	2	0.299	0.227	11.338	0.001
. |*. |	. | . |	3	0.165	0.030	13.087	0.001
. | . |	.*| . |	4	0.047	-0.076	13.232	0.004
.*| . |	**| . |	5	-0.132	-0.202	14.391	0.006
.*| . |	. | . |	6	-0.103	-0.039	15.111	0.010
.*| . |	. | . |	7	-0.167	-0.055	17.032	0.009
. | . |	. |*. |	8	-0.036	0.111	17.122	0.017
**| . |	.*| . |	9	-0.216	-0.187	20.481	0.009
.*| . |	.*| . |	10	-0.139	-0.096	21.898	0.009
.*| . |	.*| . |	11	-0.153	-0.068	23.648	0.009
. | . |	. |*. |	12	-0.051	0.068	23.843	0.013

Table 3a.50- ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	6.194134	0.015817	5.776425	0.016243
Lag 7	1.964342	0.081957	12.38123	0.088699
Lag 12	1.126062	0.372395	13.36692	0.342945

Table 3a.51- Correlation Matrix

	KKDTGARCH1	KKDTGARCH12	SSDTRESID1	SSDTRESID12
KKDTGARCH1	1.000000	0.958022	0.430025	0.402952
KKDTGARCH12	0.958022	1.000000	0.414872	0.445200
SSDTRESID1	0.430025	0.414872	1.000000	0.886241
SSDTRESID12	0.402952	0.445200	0.886241	1.000000

25- RUBBER AND PLASTIC PRODUCTS

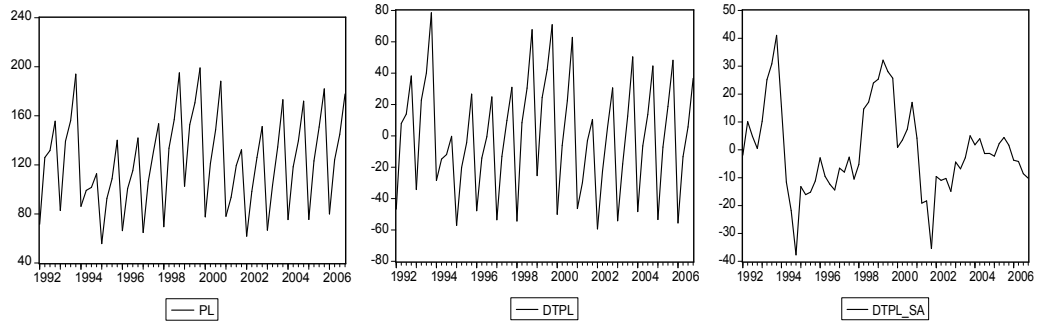


Table3a.52-Augmented Dickey Fuller Results of the Rubber and Plastics Product Industry Real Wage Index

PL			DTPL		DTPL_SA	
	t	p	t	p	t	p
None	-0.430799	0.5230	-3.933028	0.0002	-2.668330	0.0084
cons	-3.514729	0.0112	-3.893851	0.0038	-2.645160	0.0899
Con,trend	-3.608823	0.0382	-3.887347	0.0192	-2.680195	0.2484

AR MODELLING OF ISIC REV3-25 RUBBER AND PLASTIC PRODUCTS

Table3a.53-AR(1) Model of D-trended Real Wage Index of ISIC Rev 25

model	B	SE	P
ARMA			
C	-0.586497	5.950934	0.9218
AR(1)	0.777975	0.083936	0.0000
R-squared	0.601140	Mean dependent var	-0.095283
Adjusted R-squared	0.594142	S.D. dependent var	15.91758
S.E. of regression	10.14061	Akaike info criterion	7.504284
Sum squared resid	5861.423	Schwarz criterion	7.574709
Log likelihood	-219.3764	F-statistic	85.90720
Durbin-Watson stat	1.697355	Prob(F-statistic)	0.000000
Inverted AR Roots	.78		

Figure 3a.33-Q-statistic probabilities for residuals obtained in AR (1) model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.136	0.136	1.1407	
. |*. |	. |*. |	2	0.120	0.104	2.0535	0.152
**| . |	**| . |	3	-0.208	-0.243	4.8235	0.090
.*| . |	.*| . |	4	-0.121	-0.080	5.7769	0.123
. | . |	. |*. |	5	0.021	0.116	5.8072	0.214
. | . |	. | . |	6	0.031	-0.008	5.8714	0.319
. | . |	.*| . |	7	-0.045	-0.129	6.0133	0.422
.*| . |	.*| . |	8	-0.163	-0.144	7.8898	0.342
. | . |	. |*. |	9	0.047	0.159	8.0472	0.429
.*| . |	.*| . |	10	-0.136	-0.167	9.4105	0.400
. | . |	.*| . |	11	-0.038	-0.156	9.5167	0.484
**| . |	.*| . |	12	-0.200	-0.139	12.565	0.323

Table3a.54- Breusch -Godfrey Serial Correlation LM Test

Breusch -Godfrey	F-statistic	Probability	Obs*R-squared	Probability
Lag 2	2.581699	0.084788	5.063551	0.079518
Lag 7	1.350957	0.246830	9.384061	0.226245
Lag 12	1.308138	0.247516	15.25861	0.227598

Figure3a.34- Q-Statistic Probabilities for Squared Residuals Obtained from AR (1)

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |** |	. |** |	1	0.249	0.249	3.8414	
. |*** |	. |*** |	2	0.377	0.336	12.825	0.000
. |** |	. |*. |	3	0.231	0.103	16.266	0.000
. |*. |	.*| . |	4	0.102	-0.091	16.942	0.001
. | . |	.*| . |	5	0.022	-0.115	16.973	0.002
.*| . |	**| . |	6	-0.183	-0.251	19.259	0.002
. | . |	. |*. |	7	0.005	0.115	19.261	0.004
.*| . |	. |*. |	8	-0.094	0.087	19.890	0.006
**| . |	**| . |	9	-0.281	-0.288	25.555	0.001
.*| . |	.*| . |	10	-0.140	-0.098	26.999	0.001
.*| . |	. | . |	11	-0.149	0.063	28.660	0.001
. | . |	. |** |	12	0.009	0.221	28.666	0.003

Table3a.55- ARCH-LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	3.903524	0.053120	3.779484	0.051885
Lag 7	2.534471	0.027852	14.94214	0.036748
Lag 12	1.146405	0.358117	13.53884	0.331121

GARCH MODELLING OF ISIC REV3-25 RUBBER AND PLASTIC PRODUCTS

Table3a.56-The Results of the AR (1)-GARCH (1,1) Model of D-trended Real Wage Index of ISIC Rev3-25

DTCH_SA		B	p
MODEL	GARCH		
Mean eq.			
	C	-1.790530	0.6597
	AR(1)	0.728726	0.0000
Variance eq			
GARCH(1,1)	C	6.859817	0.4523
	ARCH1	0.473421	0.2429
	GARCH1	0.513453	0.0962
R-squared	0.598217	Mean dependent	-0.095283
Adjusted R-squared	0.568455	S.D. dependent	15.91758
S.E. of regression	10.45659	Akaike info	7.401648
Sum squared resid	5904.374	Schwarz criterion	7.577711
Log likelihood	-213.3486	F-statistic	20.10023
Durbin-Watson stat	1.607367	Prob(F-statistic)	0.000000
Inverted AR Roots	.73		

Figure 3a.34- Q-Statistics Probabilities of Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.134	0.134	1.1214	
. |*. |	. |. |	2	0.068	0.051	1.4127	0.235
.*| . |	.*| . |	3	-0.135	-0.153	2.5755	0.276
. |. |	. |. |	4	-0.019	0.015	2.5997	0.458
. |. |	. |*. |	5	0.050	0.074	2.7675	0.597
. |. |	. |. |	6	0.024	-0.014	2.8073	0.730
.*| . |	.*| . |	7	-0.133	-0.154	4.0349	0.672
.*| . |	.*| . |	8	-0.184	-0.138	6.4213	0.492
. |*. |	. |*. |	9	0.101	0.188	7.1552	0.520
.*| . |	**| . |	10	-0.135	-0.210	8.4989	0.485
.*| . |	.*| . |	11	-0.078	-0.134	8.9593	0.536
**| . |	.*| . |	12	-0.272	-0.187	14.625	0.200

Figure 3a.35- Q-Statistics Probabilities of Squared Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.*| . |	.*| . |	1	-0.145	-0.145	1.3078	
. |*. |	. |*. |	2	0.184	0.167	3.4533	0.063
. |. |	. |. |	3	-0.039	0.008	3.5488	0.170
. |. |	. |. |	4	0.005	-0.031	3.5506	0.314
. |. |	. |. |	5	-0.019	-0.018	3.5749	0.467
.*| . |	.*| . |	6	-0.107	-0.112	4.3575	0.499
. |*. |	. |*. |	7	0.173	0.162	6.4392	0.376
.*| . |	. |. |	8	-0.071	0.005	6.7940	0.451
.*| . |	**| . |	9	-0.151	-0.242	8.4444	0.391
. |. |	. |. |	10	-0.014	-0.047	8.4595	0.489
.*| . |	.*| . |	11	-0.175	-0.129	10.763	0.376
. |** |	. |** |	12	0.237	0.246	15.066	0.179

Table 3a.57--The Results of the ARCH-LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	1.222940	0.273513	1.239547	0.265558
Lag 7	0.778071	0.608962	5.727766	0.571872
Lag 12	0.844936	0.606227	10.79638	0.546445

MANUFACTURE OF NON-METALLIC MINERAL PRODUCTS (ISIC REV3-26)

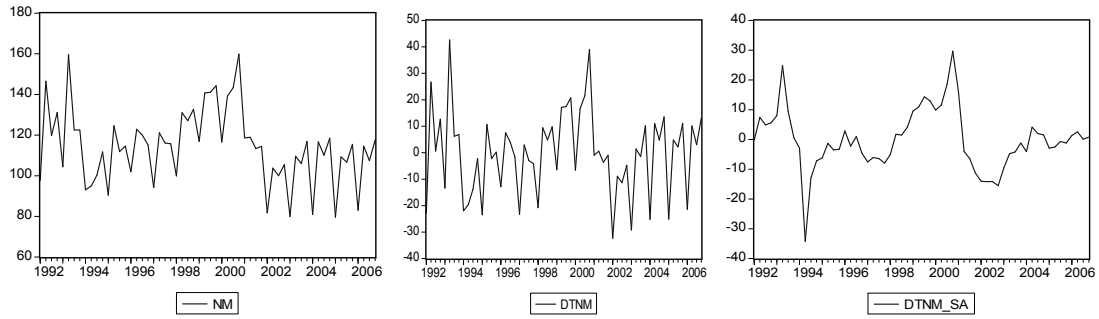


Table3a.58- The Augmented Dickey Fuller Test Results of Manufacture of Non-Metallic Products Real Wage Index

NM			DTNM		DTNM_SA	
	t	p	t	p	t	p
None	0.198210	0.7397	-2.924540	0.0042	-3.010903	0.0032
cons	-2.163494	0.2218	-2.925118	0.0494	-2.985674	0.0422
Con,trend	-2.274960	0.4394	-2.915655	0.1664	-2.947046	0.1560

AR (1) MODELS OF ISIC REV3. 26- MANUFACTURE OF NON-METALIC PRODUCTS

Table3a.59- AR (1) Model of the Industry D-trended Real Wage Index of ISIC Rev3-26

model	B	SE	P
ARMA			
C	-0.023030	3.371424	0.9946
AR(1)	0.722951	0.091523	0.0000
R-squared	0.522597	Mean dependent var	-0.067253
Adjusted R-squared	0.514222	S.D. dependent var	10.29364
S.E. of regression	7.174441	Akaike info criterion	6.812237
Sum squared resid	2933.939	Schwarz criterion	6.882662
Log likelihood	-198.9610	F-statistic	62.39600
Durbin-Watson stat	1.880117	Prob(F-statistic)	0.000000
Inverted AR Roots	.72		

Table3a.60- Breusch -Godfrey Serial Correlation LM Test

Breusch -Godfrey	F-statistic	Probability	Obs*R-squared	Probability
Lag 2	0.385292	0.682074	0.815204	0.665243
Lag 7	1.095567	0.380454	7.845970	0.346372
Lag 12	0.780635	0.666848	10.16579	0.601419

Figure 3a.36-Q-Statistic Probabilities for Residuals Obtained from AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	0.050	0.050	0.1579	
. | . |	. | . |	2	0.039	0.036	0.2532	0.615
. |*. |	. |*. |	3	0.084	0.080	0.7046	0.703
**| . |	**| . |	4	-0.236	-0.248	4.3503	0.226
. | . |	. |*. |	5	0.062	0.089	4.6046	0.330
. | . |	. | . |	6	-0.008	-0.009	4.6092	0.465
.*| . |	.*| . |	7	-0.145	-0.116	6.0688	0.416
.*| . |	**| . |	8	-0.124	-0.192	7.1595	0.412
.*| . |	. | . |	9	-0.116	-0.053	8.1338	0.421
. | . |	. | . |	10	-0.024	0.013	8.1763	0.516
. | . |	. | . |	11	0.022	-0.011	8.2140	0.608
.*| . |	.*| . |	12	-0.082	-0.148	8.7253	0.647

Table3a.61- ARCH-LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.382121	0.538976	0.393086	0.530682
Lag 7	0.565368	0.779790	4.291166	0.745696
Lag 12	0.989200	0.478597	12.16272	0.432702

GARCH MODEL OF ISIC REV3. 26- MANUFACTURE OF NON-METALIC PRODUCTS

Table3a.62- GARCH Estimation Result of D-trended Real Wage Index of ISIC Rev3-26

DTCH_SA		B	p
MODEL	GARCH		
Mean eq.			
	C	6.787825	0.5078
	AR(1)	0.893439	0.0000
	MA(1)	0.110256	0.5920
Variance eq			
GARCH(1,1)	C	2.343164	0.3861
	ARCH1	0.415655	0.0076
	GARCH1	0.607311	0.0000
R-squared	0.477391	Mean dependent	-0.067253
Adjusted R-squared	0.428089	S.D. dependent	10.29364
S.E. of regression	7.784548	Akaike info	6.681397
Sum squared resid	3211.757	Schwarz criterion	6.892672
Log likelihood	-191.1012	F-statistic	9.682859
Durbin-Watson stat	2.294060	Prob(F-statistic)	0.000001
Inverted AR Roots	.89		
Inverted MA Roots	-.11		

Figure 3a.37-Q-Statistics Probabilities of Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	-0.056	-0.056	0.1947	
. | . |	. | . |	2	-0.045	-0.048	0.3218	
. | . |	. | . |	3	-0.029	-0.035	0.3776	0.539
.*| . |	.*| . |	4	-0.167	-0.174	2.1945	0.334
. |*. |	. |*. |	5	0.099	0.077	2.8497	0.415
. | . |	. | . |	6	-0.000	-0.009	2.8497	0.583
.*| . |	.*| . |	7	-0.081	-0.088	3.3029	0.653
.*| . |	.*| . |	8	-0.092	-0.129	3.8947	0.691
. | . |	. | . |	9	-0.052	-0.047	4.0887	0.770
. |*. |	. | . |	10	0.079	0.049	4.5494	0.804
. | . |	. | . |	11	0.046	0.013	4.7064	0.859
.*| . |	.*| . |	12	-0.109	-0.137	5.6155	0.846

Figure 3a.38-Q-Statistics Probabilities of Squared Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	0.047	0.047	0.1396	
.*| . |	.*| . |	2	-0.085	-0.087	0.5924	
. | . |	. | . |	3	-0.048	-0.039	0.7378	0.390
. |** |	. |** |	4	0.325	0.326	7.6451	0.022
.*| . |	.*| . |	5	-0.086	-0.146	8.1413	0.043
.*| . |	. | . |	6	-0.110	-0.055	8.9694	0.062
.*| . |	.*| . |	7	-0.089	-0.062	9.5142	0.090
.*| . |	**| . |	8	-0.069	-0.214	9.8455	0.131
. | . |	. | . |	9	-0.039	0.049	9.9549	0.191
. | . |	. | . |	10	-0.025	-0.008	9.9994	0.265
. | . |	. | . |	11	-0.044	-0.037	10.143	0.339
. | . |	. | . |	12	-0.044	0.042	10.295	0.415

Table3a.63- The Results of ARCH- LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.127488	0.722393	0.131741	0.716633
Lag 7	2.172934	0.055312	13.35823	0.063847
Lag 12	0.648099	0.786304	8.749455	0.724168

BASIC METAL INDUSTRIES (27)

27- BASIC METAL INDUSTRY

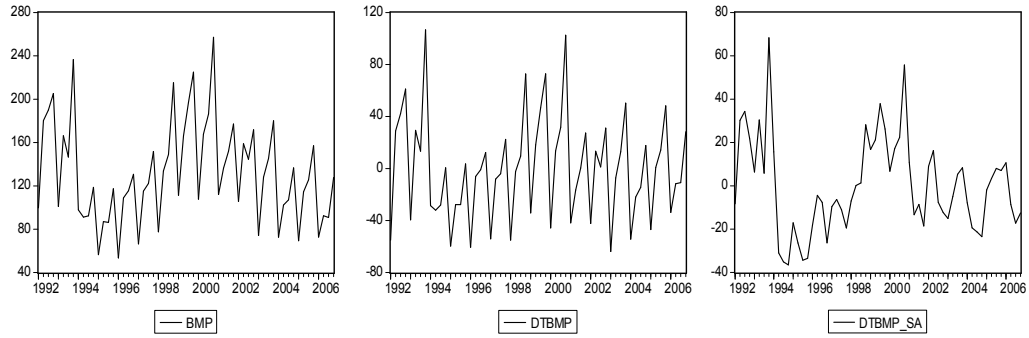


Table3a.64-Augmented Dickey Fuller Results of the Basic Metal Industry Real Wage Index

BMP			DTBMP		DTBMP_SA	
	t	p	t	p	t	p
None	-0.997439	0.2820	-3.515691	0.0007	-3.767262	0.0003
cons	-2.997920	0.0418	-3.553591	0.0103	-3.734528	0.0059
Con,trend	-2.969045	0.1508	-3.678890	0.0330	-3.741259	0.0271

AR MODEL OF ISIC REV3-27 BASIC METAL INDUSTRY

Table3a.65- AR (1) Model of the D-trended Real Wage Index of ISIC Rev3-27

model			Adj. R^2
ARMA			
			0.354081
C	0.044592	0.9940	
AR(1)	0.605279	0.0000	
R-squared	0.365217	Mean dependent	0.153649
Adjusted R-squared	0.354081	S.D. dependent var	22.17294
S.E. of regression	17.82020	Akaike info	8.631852
Sum squared resid	18100.88	Schwarz criterion	8.702277
Log likelihood	-252.6396	F-statistic	32.79450
Durbin-Watson stat	1.849560	Prob(F-statistic)	0.000000
Inverted AR Roots	.61		

Figure3a-39-Q-Statistic Probabilities for Residuals Obtained from AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	0.039	0.039	0.0963	
. | . |	. | . |	2	-0.016	-0.017	0.1120	0.738
.*| . |	.*| . |	3	-0.075	-0.074	0.4711	0.790
. | . |	. | . |	4	-0.041	-0.035	0.5791	0.901
. |** |	. |** |	5	0.256	0.259	4.9410	0.293
. |*. |	. |*. |	6	0.176	0.161	7.0461	0.217
.*| . |	.*| . |	7	-0.139	-0.167	8.3848	0.211
.*| . |	.*| . |	8	-0.162	-0.142	10.237	0.176
.*| . |	.*| . |	9	-0.124	-0.077	11.352	0.183
. | . |	. | . |	10	0.043	-0.009	11.486	0.244
. | . |	.*| . |	11	0.004	-0.117	11.487	0.321
**| . |	**| . |	12	-0.198	-0.211	14.491	0.207

Table33a.66- Breusch -Godfrey Serial Correlation LM Test

Breusch -Godfrey	F-statistic	Probability	Obs*R-squared	Probability
Lag 2	0.164535	0.848704	0.350903	0.839078
Lag 7	2.061558	0.065350	13.21452	0.067051
Lag 12	1.317930	0.242212	15.34312	0.223206

Figure3a-40-Q-Statistic Probabilities for Residuals Obtained from AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.096	0.096	0.5722	
. |** |	. |** |	2	0.302	0.296	6.3328	0.012
.*| . |	.*| . |	3	-0.060	-0.120	6.5605	0.038
. | . |	.*| . |	4	-0.025	-0.111	6.6007	0.086
. | . |	. | . |	5	-0.020	0.052	6.6276	0.157
. |*. |	. |*. |	6	0.138	0.195	7.9191	0.161
. | . |	. | . |	7	-0.001	-0.056	7.9192	0.244
. | . |	.*| . |	8	0.052	-0.068	8.1080	0.323
.*| . |	. | . |	9	-0.082	-0.047	8.5913	0.378
. | . |	. | . |	10	-0.056	-0.015	8.8179	0.454
.*| . |	.*| . |	11	-0.100	-0.058	9.5663	0.479
. | . |	. | . |	12	-0.006	0.000	9.5688	0.570

Table33a.67- ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.571504	0.452830	0.585935	0.443995
Lag 7	3.041181	0.010681	16.95542	0.017686
Lag 12	0.539643	0.873029	7.519537	0.821461

Table3a.68- The Results of the AR (1)-GARCH (1,1) :Model of the D-trended Real Wage Index of ISIC Rev3-27

DTBMP_SA		B	p
MODEL	GARCH		
Mean eq.			
	C	9.908041	0.3941
	AR(1)	0.811496	0.0000
Variance eq			
GARCH(1,1)	C	165.3956	0.0008
	ARCH1	0.493718	0.0779
R-squared	0.315383	Mean dependent	0.153649
Adjusted R-squared	0.278040	S.D. dependent v	22.17294
S.E. of regression	18.83995	Akaike info	8.578532
Sum squared resid	19521.91	Schwarz criterion	8.719382
Log likelihood	-249.0667	F-statistic	8.445628
Durbin-Watson stat	2.124873	Prob(F-statistic)	0.000104
Inverted AR Roots	.81		

Figure3a.41-Q-Statistics Probabilities of Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.*| . |	.*| . |	1	-0.122	-0.122	0.9189	
.*| . |	.*| . |	2	-0.102	-0.119	1.5767	0.209
.*| . |	.*| . |	3	-0.121	-0.154	2.5219	0.283
.*| . |	.*| . |	4	-0.121	-0.182	3.4841	0.323
. |** |	. |*. |	5	0.252	0.184	7.7098	0.103
. |*. |	. |*. |	6	0.154	0.186	9.3210	0.097
.*| . |	. | . |	7	-0.109	-0.047	10.141	0.119
.*| . |	.*| . |	8	-0.103	-0.062	10.888	0.144
.*| . |	. | . |	9	-0.076	-0.022	11.299	0.185
. |*. |	. |*. |	10	0.149	0.105	12.920	0.166
. | . |	. | . |	11	0.061	-0.023	13.201	0.213
**| . |	**| . |	12	-0.222	-0.263	16.988	0.108

Figure3a.42-Q-Statistics Probabilities of Squared Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	-0.047	-0.047	0.1387	
. |*. |	. |*. |	2	0.074	0.072	0.4847	0.486
. | . |	. | . |	3	-0.042	-0.036	0.5999	0.741
.*| . |	.*| . |	4	-0.063	-0.072	0.8575	0.836
. | . |	. | . |	5	0.002	0.002	0.8578	0.931
. | . |	. | . |	6	0.028	0.038	0.9129	0.969
. | . |	. | . |	7	-0.001	-0.004	0.9130	0.989
. |*. |	. |*. |	8	0.088	0.080	1.4627	0.984
.*| . |	.*| . |	9	-0.103	-0.094	2.2195	0.974
.*| . |	.*| . |	10	-0.072	-0.092	2.6043	0.978
.*| . |	.*| . |	11	-0.128	-0.118	3.8364	0.954

Table3a.69-The Results of the ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.108921	0.742608	0.112592	0.742608
Lag 7	0.742608	0.992628	1.240093	0.989974
Lag 12	0.569242	0.851030	7.862983	0.795744

Table 3a.70- Correlation Matrix

	KKDTARCH1	KKDTGARCH1	SSDTRESID1
KKDTARCH1	1.000000	0.990068	0.425543
KKDTGARCH1	0.990068	1.000000	0.379634
SSDTRESID1	0.425543	0.379634	1.000000

MANUFACTURE OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT (29-32-34)

29- MACHINERY AND EQUIPMENT N.E.C.

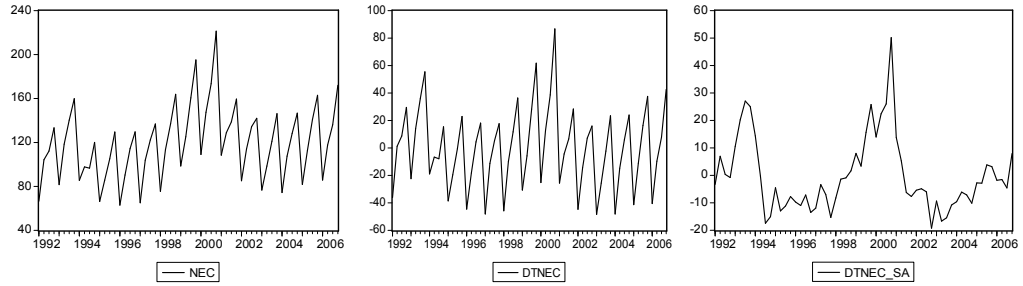


Table3a.71- Augmented Dickey Fuller Test Results of the Machinery and Equipment Industry Real Wage Index

NEC			DTNEC		DTNEC_SA	
	t	p	t	p	t	p
None	-0.168906	0.6207	-3.200398	0.0019	-2.700199	0.0077
cons	-2.449367	0.1334	-3.171263	0.0272	-2.674865	0.0844
Con,trend	-2.701391	0.2402	-3.121858	0.1116	-2.661581	0.2559

AR MODEL OF ISIC REV3-29- MACHINERY AND EQUIPMENT N.E.C.

Table3a.72 -AR(1) Model of the D-trended Real Wage Index of ISIC Rev3-29

model	B	SE	P
ARMA			
C	0.628914	5.051309	0.9014
AR(1)	0.774414	0.084335	0.0000
R-squared	0.596658	Mean dependent var	-0.024137
Adjusted R-squared	0.589582	S.D. dependent var	13.63581
S.E. of regression	8.735633	Akaike info criterion	7.206008
Sum squared resid	4349.743	Schwarz criterion	7.276433
Log likelihood	-210.5772	F-statistic	84.31918
Durbin-Watson stat	1.892055	Prob(F-statistic)	0.000000
Inverted AR Roots	.77		

Figure3a.43-Q-Statistic Probabilities for Residuals Obtained from AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	0.038	0.038	0.0914	
. | . |	. | . |	2	0.059	0.058	0.3146	0.575
. | . |	. | . |	3	-0.045	-0.050	0.4476	0.799
. | . |	. | . |	4	0.051	0.052	0.6188	0.892
. | . |	. | . |	5	-0.013	-0.011	0.6298	0.960
. | . |	. | . |	6	-0.016	-0.024	0.6474	0.986
. |*. |	. |*. |	7	0.100	0.109	1.3422	0.969
**| . |	**| . |	8	-0.237	-0.253	5.3033	0.623
. | . |	. |*. |	9	0.051	0.072	5.4894	0.704
. | . |	. | . |	10	-0.038	-0.007	5.5932	0.780
.*| . |	**| . |	11	-0.130	-0.190	6.8620	0.738
**| . |	.*| . |	12	-0.236	-0.186	11.115	0.434

Table3a.73-Breusch -Godfrey Serial Correlation LM Test

Breusch-Godfrey	F-statistic	Probability	Obs*R-squared	Probability
Lag 2	0.318800	0.728356	0.676132	0.713148
Lag 7	1.010790	0.435141	7.314101	0.396925
Lag 12	0.977905	0.483555	12.20337	0.429488

Figure3a.44-Q-Statistic Probabilities for Squared Residuals Obtained from AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*** |	. |*** |	1	0.407	0.407	10.263	
. | . |	.*| . |	2	0.058	-0.128	10.478	0.001
. | . |	. | . |	3	0.027	0.063	10.524	0.005
. | . |	. | . |	4	0.008	-0.026	10.528	0.015
. |*. |	. |*. |	5	0.066	0.089	10.822	0.029
.*| . |	.*| . |	6	-0.080	-0.178	11.254	0.047
. | . |	. |*. |	7	-0.030	0.108	11.318	0.079
. | . |	. | . |	8	0.018	-0.032	11.340	0.124
.*| . |	.*| . |	9	-0.093	-0.104	11.957	0.153
.*| . |	. | . |	10	-0.083	-0.012	12.461	0.189
.*| . |	.*| . |	11	-0.151	-0.121	14.178	0.165
. | . |	. |*. |	12	-0.043	0.078	14.318	0.216

Table3a.74- The Result of ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	10.95643	0.001636	9.490844	0.002065
Lag 7	1.847714	0.101916	11.81312	0.106875
Lag 12	1.087487	0.400574	13.03602	0.366428

GARCH MODEL OF ISIC REV3-29- MACHINERY AND EQUIPMENT N.E.C.

Table3a.75-The Results of the AR(1)-ARCH(1,1) Model of the D-trended Real Wage Index of ISIC Rev3-29

DTNEC_SA		B	p
MODEL	GARCH		
Mean eq.			
	C	0.976538	0.8505
	AR(1)	0.806015	0.0000
Variance eq			
GARCH(1,1)	C	36.98703	0.0038
	ARCH1	0.607994	0.0623
R-squared	0.595655	Mean dependent var	-0.024137
Adjusted R-squared	0.573600	S.D. dependent var	13.63581
S.E. of regression	8.904090	Akaike info	7.118593
Sum squared resid	4360.555	Schwarz criterion	7.259443
Log likelihood	-205.9985	F-statistic	27.00750
Durbin-Watson stat	1.947221	Prob(F-statistic)	0.000000
Inverted AR Roots	.81		

Figure3a.45-Q-Statistics Probabilities of Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.070	0.070	0.3066	
. | . |	. | . |	2	0.059	0.054	0.5255	0.469
. | . |	. | . |	3	0.012	0.004	0.5343	0.766
. | . |	. | . |	4	0.004	0.000	0.5356	0.911
. |*. |	. |*. |	5	0.079	0.079	0.9536	0.917
. | . |	. | . |	6	0.038	0.028	1.0514	0.958
. |*. |	. | . |	7	0.078	0.065	1.4676	0.962
**| . |	**| . |	8	-0.221	-0.239	4.9191	0.670
. | . |	. | . |	9	0.032	0.061	4.9937	0.758
.*| . |	. | . |	10	-0.058	-0.051	5.2375	0.813
.*| . |	.*| . |	11	-0.135	-0.141	6.6130	0.761
**| . |	**| . |	12	-0.240	-0.252	11.036	0.440

Figure3a.46- Q-Statistics Probabilities of Squared Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	-0.026	-0.026	0.0407	
. | . |	. | . |	2	0.021	0.020	0.0681	0.794
. | . |	. | . |	3	0.004	0.005	0.0692	0.966
.*| . |	.*| . |	4	-0.072	-0.073	0.4112	0.938
. |*. |	. |*. |	5	0.148	0.145	1.8749	0.759
.*| . |	.*| . |	6	-0.145	-0.141	3.3125	0.652
. | . |	. | . |	7	-0.047	-0.057	3.4682	0.748
. |** |	. |** |	8	0.214	0.224	6.6914	0.462
.*| . |	.*| . |	9	-0.105	-0.094	7.4848	0.485
. | . |	. | . |	10	0.011	-0.046	7.4937	0.586
.*| . |	.*| . |	11	-0.123	-0.077	8.6261	0.568
. | . |	. | . |	12	-0.004	0.018	8.6273	0.656

Table3a.76- The Results of ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.061683	0.804765	0.063815	0.800564
Lag 7	0.366725	0.916691	2.866574	0.897065
Lag 12	0.422156	0.943760	6.094726	0.911232

Table 3a.77- Correlation Matrix

	KKDTARCH1	KKDTGARCH1	SSDTRESID1
KKDTARCH1	1.000000	0.273683	0.386093
KKDTGARCH1	0.273683	1.000000	-0.025269
SSDTRESID1	0.386093	-0.025269	1.000000

32- RADIO, TV, COMMUNICATION. EQUIPMENT

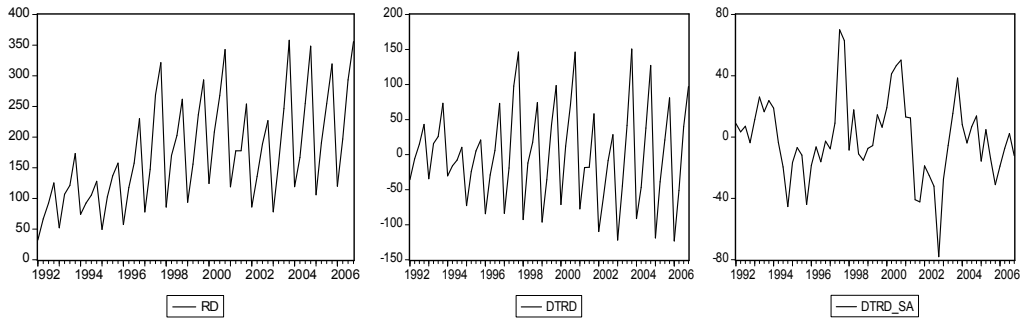


Table3a.78-Augmented Dickey Fuller Test Results of the Radio, Tv, Communication and Equipment Industry Real Wage Index

RD			DTRD		DTRD_SA	
	t	p	t	p	t	p
None	0.496945	0.8196	-3.826905	0.0003	-3.728519	0.0003
cons	-1.698031	0.4266	-3.794766	0.0051	-3.702659	0.0065
Con,trend	-3.002132	0.1410	-3.804420	0.0237	-3.711643	0.0292

AR MODEL OF ISIC REV3. 32- RADIO, TV, COMMUNICATION, EQUIPMENT

Table 3a.79- The Results of the AR(1) Model of the D-trended Real Wage Index of ISIC Rev3-32

model			Adj. R^2
ARMA			
			0.363014
C	-1.619183	0.8210	
AR(1)	0.611808	0.0000	
R-squared	0.373996	Mean dependent var	-1.058927
Adjusted R-squared	0.363014	S.D. dependent var	26.60383
S.E. of regression	21.23290	Akaike info criterion	8.982291
Sum squared resid	25697.64	Schwarz criterion	9.052716
Log likelihood	-262.9776	F-statistic	34.05377
Durbin-Watson stat	1.858658	Prob(F-statistic)	0.000000
Inverted AR Roots	.61		

Figure3a.47-Q-Statistic Probabilities for Residuals Obtained in AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |*. |	. |*. |	1	0.071	0.071	0.3138	
. | . |	. | . |	2	-0.039	-0.044	0.4091	0.522
. | . |	. | . |	3	0.024	0.030	0.4455	0.800
.*| . |	.*| . |	4	-0.130	-0.136	1.5439	0.672
. | . |	. | . |	5	0.027	0.051	1.5931	0.810
.*| . |	.*| . |	6	-0.121	-0.145	2.5932	0.762
.*| . |	.*| . |	7	-0.134	-0.103	3.8360	0.699
**| . |	**| . |	8	-0.246	-0.280	8.1213	0.322
.*| . |	. | . |	9	-0.072	-0.039	8.4897	0.387
. | . |	.*| . |	10	-0.013	-0.093	8.5020	0.484
. | . |	. | . |	11	-0.034	-0.055	8.5906	0.571
. |*. |	. |*. |	12	0.165	0.082	10.674	0.471

Table 3a.80- Breusch -Godfrey Serial Correlation LM Test

Breusch -Godfrey	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.375073	0.688983	0.793875	0.672376
Lag 7	0.476143	0.847276	3.687152	0.815023
Lag 12	0.888815	0.564219	11.30463	0.503008

Figure3a.48-Q-Statistic Probabilities for Squared Residuals Obtained from AR (1)

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	-0.009	-0.009	0.0052	
. |*. |	. |*. |	2	0.084	0.084	0.4511	0.502
.*| . |	.*| . |	3	-0.081	-0.080	0.8742	0.646
. | . |	. | . |	4	-0.011	-0.019	0.8818	0.830
. | . |	. |*. |	5	0.054	0.069	1.0787	0.898
.*| . |	.*| . |	6	-0.165	-0.172	2.9344	0.710
.*| . |	.*| . |	7	-0.059	-0.074	3.1762	0.786
.*| . |	. | . |	8	-0.075	-0.036	3.5690	0.828
. | . |	. | . |	9	0.006	-0.013	3.5715	0.894
. | . |	. | . |	10	-0.024	-0.036	3.6138	0.935
. |*. |	. |*. |	11	0.117	0.134	4.6386	0.914
. | . |	.*| . |	12	-0.044	-0.064	4.7847	0.941

Table 3a.81- The results of ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.002295	0.961959	0.002377	0.961113
Lag 7	0.356376	0.922396	2.790020	0.903724
Lag 12	0.250487	0.993145	3.817631	0.986507

GARCH MODEL OF ISIC REV3. 32- RADIO, TV, COMMUNICATION, EQUIPMENT

Table3a.82-The Results of the AR(1)-GARCH(1,1) Model of the D-trended Real Wage Index of ISIC Rev3-32

DTRD_SA		B	p
MODEL	GARCH		
Mean eq.			
	C	3.580722	0.2674
	AR(1)	0.602275	0.0000
Variance eq			
GARCH(1,1)	C	20.26666	0.0000
	ARCH1	-0.119315	0.0071
	GARCH1	1.108043	0.0000
R-squared	0.367810	Mean dependent	-1.058927
Adjusted R-squared	0.320981	S.D. dependent	26.60383
S.E. of regression	21.92225	Akaike info	8.876491
Sum squared resid	25951.60	Schwarz criterion	9.052554
Log likelihood	-256.8565	F-statistic	7.854333
Durbin-Watson stat	1.823911	Prob(F-statistic)	0.000046
Inverted AR Roots	.60		

Figure3a.49- Q-statistics probabilities of the residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	0.020	0.020	0.0249	
. | . |	. | . |	2	-0.019	-0.019	0.0476	0.827
. | . |	. | . |	3	0.041	0.042	0.1562	0.925
.*| . |	.*| . |	4	-0.168	-0.171	2.0121	0.570
. | . |	. | . |	5	-0.022	-0.012	2.0432	0.728
.*| . |	.*| . |	6	-0.128	-0.141	3.1531	0.676
.*| . |	.*| . |	7	-0.123	-0.108	4.1991	0.650
**| . |	**| . |	8	-0.238	-0.289	8.2015	0.315
.*| . |	.*| . |	9	-0.068	-0.088	8.5328	0.383
. | . |	.*| . |	10	0.008	-0.081	8.5372	0.481
. | . |	.*| . |	11	-0.017	-0.076	8.5579	0.575
. |*. |	. |*. |	12	0.191	0.069	11.356	0.414

Figure3a.50-Q-Statistics Probabilities of squared Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	0.057	0.057	0.1996	
. | . |	. | . |	2	0.020	0.016	0.2236	0.636
.*| . |	.*| . |	3	-0.102	-0.105	0.8957	0.639
. |*. |	. |*. |	4	0.098	0.111	1.5246	0.677
. |*. |	. |*. |	5	0.088	0.082	2.0464	0.727
.*| . |	**| . |	6	-0.175	-0.208	4.1226	0.532
.*| . |	.*| . |	7	-0.157	-0.122	5.8236	0.443
.*| . |	.*| . |	8	-0.105	-0.070	6.6040	0.471
. | . |	. | . |	9	0.060	0.023	6.8654	0.551
. | . |	. | . |	10	-0.029	-0.030	6.9264	0.645
. |*. |	. |*. |	11	0.075	0.127	7.3514	0.692
. | . |	. | . |	12	-0.042	-0.035	7.4874	0.758

Table 3a.83-The Results of the ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.211702	0.647218	0.218437	0.640233
Lag 7	0.605567	0.748030	4.569470	0.712337
Lag 12	0.429723	0.940096	6.189585	0.906225

34- MANUFACTURE OF MOTOR VEHICLES, TRAILERS

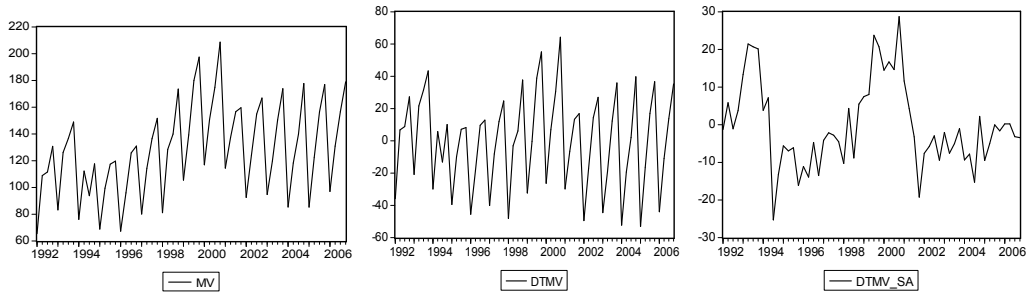


Table3a.84-Augmented Dickey Fuller Test Results of the Motor Vehicles, Trailers Industry Real Wage Index

MV			DTMV		DTMV_SA	
	t	p	t	p	t	p
None	0.195542	0.7393	-3.348088	0.0012	-2.348138	0.0194
cons	-1.820506	0.3669	-3.331357	0.0182	-2.329445	0.1664
Con,trend	-2.493753	0.3300	-3.257739	0.0844	-2.334721	0.4090

AR MODEL OF ISIC REV3. 34- MANUFACTURE OF MOTOR VEHICLES, TRAILERS

Table3a.85-AR (1) Model of the D-trended Real Wage Index of ISIC Rev3-34

model	B	SE	P
ARMA			
C	-0.253167	3.401159	0.9409
AR(1)	0.674212	0.097935	0.0000
R-squared	0.453985	Mean dependent var	-0.176632
Adjusted R-squared	0.444406	S.D. dependent var	11.41794
S.E. of regression	8.510723	Akaike info criterion	7.153841
Sum squared resid	4128.647	Schwarz criterion	7.224266
Log likelihood	-209.0383	F-statistic	47.39283
Durbin-Watson stat	2.315745	Prob(F-statistic)	0.000000
Inverted AR Roots	.67		

Figure3a.51-Q-Statistic Probabilities for Residuals Obtained from AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.*| . |	.*| . |	1	-0.165	-0.165	1.6810	
.|** |	.|** |	2	0.282	0.262	6.6899	0.010
.| . |	.|*. |	3	-0.008	0.076	6.6941	0.035
.*| . |	.*| . |	4	-0.072	-0.152	7.0298	0.071
.|*. |	.|*. |	5	0.141	0.107	8.3631	0.079
.*| . |	.*| . |	6	-0.150	-0.064	9.8965	0.078
.|*. |	.| . |	7	0.138	0.048	11.211	0.082
.*| . |	.*| . |	8	-0.152	-0.094	12.847	0.076
.| . |	.*| . |	9	-0.029	-0.093	12.907	0.115
.*| . |	.*| . |	10	-0.098	-0.092	13.613	0.137
.*| . |	.| . |	11	-0.087	-0.036	14.176	0.165
.*| . |	.*| . |	12	-0.123	-0.160	15.333	0.168

Table3a.86- Breusch -Godfrey Serial Correlation LM Test

Breusch -Godfrey	F-statistic	Probability	Obs*R-squared	Probability
Lag 2	2.835642	0.067288	5.515060	0.063448
Lag 7	1.504137	0.187541	10.26300	0.174153
Lag 12	1.023780	0.444345	12.65308	0.394752

Figure3a.51-Q-Statistic Probabilities for Residuals Obtained in AR (1) Model

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.*| . |	.*| . |	1	-0.074	-0.074	0.3406	
.*| . |	.*| . |	2	-0.079	-0.085	0.7325	0.392
.*| . |	.*| . |	3	-0.094	-0.108	1.2982	0.523
.| . |	.| . |	4	-0.018	-0.042	1.3184	0.725
.|** |	.|*. |	5	0.202	0.184	4.0345	0.401
.| . |	.| . |	6	-0.055	-0.038	4.2409	0.515
.*| . |	.*| . |	7	-0.137	-0.126	5.5391	0.477
.*| . |	.*| . |	8	-0.087	-0.085	6.0725	0.531
.|*. |	.| . |	9	0.079	0.052	6.5169	0.590
.| . |	.*| . |	10	-0.033	-0.102	6.5981	0.679
.*| . |	.*| . |	11	-0.065	-0.081	6.9150	0.733
.*| . |	.*| . |	12	-0.085	-0.058	7.4653	0.760

Table3a.87- ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.279416	0.599173	0.287959	0.591532
Lag 7	0.475864	0.846801	3.659638	0.818039
Lag 12	0.541637	0.871593	7.542864	0.819757

GARCH MODEL OF ISIC REV3. 34- MANUFACTURE OF MOTOR VEHICLES, TRAILERS

Table3a.88-The Result of the AR (1)- GARCH(1,1) Model of the D-trended Real Wage Index of ISIC Rev3-34

DTRD_SA		B	p
MODEL	GARCH		
Mean eq.			
	C	1.723330	0.5698
	AR(1)	0.613120	0.0000
Variance eq			
GARCH(1,1)	C	26.14809	0.4632
	ARCH1	-0.083633	0.3220
	GARCH1	0.710874	0.1666
R-squared	0.445778	Mean dependent	-0.176632
Adjusted R-squared	0.404725	S.D. dependent	11.41794
S.E. of regression	8.809409	Akaike info	7.185916
Sum squared resid	4190.707	Schwarz criterion	7.361978
Log likelihood	-206.9845	F-statistic	10.85847
Durbin-Watson stat	2.136169	Prob(F-statistic)	0.000002
Inverted AR Roots	.61		

Figure3a.52-Q-Statistics Probabilities of the Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.*| . |	.*| . |	1	-0.131	-0.131	1.0644	
. |** |	. |** |	2	0.299	0.286	6.6958	0.010
. | . |	. |*. |	3	0.013	0.087	6.7071	0.035
. | . |	.*| . |	4	-0.050	-0.140	6.8710	0.076
. |*. |	. |*. |	5	0.143	0.107	8.2407	0.083
.*| . |	. | . |	6	-0.109	-0.031	9.0416	0.107
. |*. |	. |*. |	7	0.146	0.067	10.513	0.105
.*| . |	.*| . |	8	-0.169	-0.138	12.535	0.084
. | . |	.*| . |	9	-0.055	-0.140	12.754	0.121
.*| . |	.*| . |	10	-0.103	-0.072	13.534	0.140
.*| . |	. | . |	11	-0.109	-0.032	14.419	0.155
.*| . |	**| . |	12	-0.159	-0.201	16.366	0.128

Figure 3a.53-Q-Statistics Probabilities of the Squared Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	-0.022	-0.022	0.0289	
.*| . |	.*| . |	2	-0.088	-0.088	0.5144	0.473
.*| . |	.*| . |	3	-0.093	-0.098	1.0707	0.585
. | . |	. | . |	4	0.025	0.012	1.1121	0.774
. |*. |	. |*. |	5	0.196	0.183	3.6632	0.454
.*| . |	.*| . |	6	-0.064	-0.061	3.9407	0.558
.*| . |	.*| . |	7	-0.128	-0.104	5.0834	0.533
.*| . |	.*| . |	8	-0.099	-0.087	5.7778	0.566
. |*. |	. | . |	9	0.086	0.051	6.3058	0.613
.*| . |	.*| . |	10	-0.074	-0.142	6.7039	0.668
.*| . |	. | . |	11	-0.062	-0.053	6.9967	0.726
.*| . |	.*| . |	12	-0.087	-0.059	7.5804	0.750

Table3a.89-The Results of the ARCH LM Test

ARCH LM Test	F-statistic	Probability	Obs*R-squared	Probability
Lag 1	0.017727	0.894559	0.018354	0.892235
Lag 7	0.407389	0.892595	3.165082	0.869322
Lag 12	0.611826	0.817044	8.346735	0.757481

APPENDIX 4: TESTS OF PANEL DATA ESTIMATIONS

Exchange Rate Uncertainty Models

Table 4a.1- Investigation of the Individual and Time Specific Effect

MODELS	Individual Fixed Effect	Individual Random Effect	Time specific Effect
Model1	F(115,1042) = 4.12 Pr = 0.0000	$\chi^2(1)$= 253.69 Pr = 0.0000	F(9,1149)= 4.41 Pr = 0.0000
Model2	F(115,1042)=4.16 Pr = 0.0000	$\chi^2(1)$= 259.67 Pr = 0.0000	F(9, 1149)= 3.12 Pr = 0.0010
Model3	F(115,1042)= 4.15 Pr = 0.0000	$\chi^2(1)$= 258.84 Pr = 0.0000	F(9, 1149) = 3.23 Pr = 0.0007
Model4	F(115,1041)= 4.16 Pr = 0.0000	$\chi^2(1)$= 254.76 Pr = 0.0000	F(9, 1148) = 4.11 Pr = 0.0000
Model5	F(115, 1041)= 4.18 Pr = 0.0000	$\chi^2(1)$= 259.68 Pr = 0.0000	F(9, 1148) = 3.02 Pr = 0.0014
Model6	F(115, 1041)= 4.17 Pr = 0.0000	$\chi^2(1)$= 258.37 Pr= 0.0000	F(9, 1148) = 3.23 Pr = 0.0007

First column of the Table 4a.1 indicates the presence of the fixed firm specific effect in the models. Breusch-Godfrey LM test has been examined to investigate whether random effects exist in the models. As seen, hypothesis of the LM cannot be accepted. So, the random individual effects are also effective in the models. Because F test in the third column postulates the time fixed effects, two way model is preferred instead of one way model. However, introducing the firm specific effects as fixed or random depends on the Hausman test.

Table4a.2- Test Results of the Investment Models Augmented with Exchange Rate Uncertainty

	Hausman Test One way	Sargan-Hansen One way	Wald test for Heterogeneity Two way	Frees Test Two way	Pesaran Test Two way	Friedman Test Two way	Wooldrige Serial cor
Model1	$\chi^2(2)$= 18.94 0.0000	$\chi^2(2)$= 25.140 0.0000	$\chi^2(116)$= 19827.57 0.0000	5.208> %1=0.5198 %5= 0.3429 %10=0.2559	1.322 Pr=0.186 abs=0.335	29.733 1.0000	2.458 Pr 0.1196
Model2	$\chi^2(2)$= 18.16 0.0001	$\chi^2(1)$= 17.209 0.0000	$\chi^2(116)$= 19827.57 0.0000	5.208> %1=0.5198 %5= 0.3429 %10=0.2559	1.322 Pr=0.186 abs=0.335	29.733 1.0000	2.458 Pr. 0.1196
Model3	$\chi^2(2)$= 18.05 0.0001	$\chi^2(1)$= 17.109 0.0000	$\chi^2(116)$= 19827.57 0.0000	5.208> %1=0.5198 %5= 0.3429 %10=0.2559	1.322 Pr=0.186 abs=0.335	29.733 1.0000	2.458 Pr 0.1196
Model4	$\chi^2(3)$= 21.63 0.0001	$\chi^2(3)$= 29.946 0.0000	$\chi^2(116)$= 18937.54 0.0000	5.417> %1=0.5198 %5= 0.3429 %10=0.2559	1.436 Pr=0.150 abs=0.336	28.612 1.0000	2.118 Pr 0.1483
Model5	$\chi^2(3)$= 20.70 0.0001	$\chi^2(2)$= 19.416 0.0001	$\chi^2(116)$= 18937.54 0.0000	5.417> %1=0.5198 %5= 0.3429 %10=0.2559	1.436 0.1509 abs=0.336	28.612 1.0000	2.118 Pr 0.1483
Model6	$\chi^2(3)$= 20.56 0.0001	$\chi^2(2)$= 19.283 0.0001	$\chi^2(116)$= 18937.54 0.0000	5.417> %1=0.5198 %5= 0.3429	1.436 0.1509 abs=0.336	28.612 1.0000	2.118 Pr 0.1483

Hausman test and Sargen-Hansen Test statistic postulates that fixed effects model should be preferred instead of random effects model. Heterogeneity test cannot be rejected so robust standard errors should be issued. Although Pesaran and Friedman tests reject the cross sectional dependency, Frees test accepts dependency. Besides these tests, abs confirms the cross sectional dependency problem. By virtue of these tests, model is estimated taking into account heterogeneity and cross sectional dependency.

Real Wage Uncertainty Models

Table 4a.3- Investigation of the Individual and Time Specific Effect

MODELS	Individual Fixed Effect	Individual Random Effect	Time specific Effect
Model1	F(115, 1042) = 4.08 Pr = 0.0000	$\chi^2(1)$ = 245.56 Pr= 0.0000	F(9, 1148) = 5.64 Pr = 0.0000
Model2	F(115, 1042) = 4.12 Pr = 0.0000	$\chi^2(1)$ = 248.76 Pr= 0.0000	F(9, 1148) = 5.55 Pr = 0.0000
Model3	F(115, 1042) = 4.08 Pr = 0.0000	$\chi^2(1)$ = 247.24 Pr=0.0000	F(9, 1148) = 5.49 Pr = 0.0000
Model4	F(115, 1041) = 4.11 Pr = 0.0000	$\chi^2(1)$ = 245.63 Pr=0.0000	F(9, 1147) = 5.56 Pr = 0.0000
Model5	F(115, 1041) = 4.14 Pr = 0.0000	$\chi^2(1)$ = 248.43 Pr=0.0000	F(9, 1147) = 5.45 Pr = 0.0000
Model6	F(115, 1041) = 4.11 Pr = 0.0000	$\chi^2(1)$ = 247.07 Pr= 0.0000	F(9, 1147) = 5.32 Pr = 0.0000

Table4a.4- Test Results of the Investment Models Augmented with Real Wage Uncertainty

	Hausman Test One way	Sargan-Hansen One way	Wald test for Heterogeneity Two way	Frees Test Two way	Pesaran Test Two way	Friedman Test Two way	Wooldrige Serial Cor.
Model1	$\chi^2(2)$= 20.64 0.0000	$\chi^2(2)$= 19.431 0.0000	$\chi^2(116)$= 19559.37 0.0000	5.237 %1=0.5198 %5= 0.3429 %10=0.2559	1.184 0.2363	27.056 1.0000	2.573 0.1114
Model2	$\chi^2(2)$= 22.58 0.0001	$\chi^2(2)$= 21.074 0.0000	$\chi^2(116)$= 19646.18 0.0000	5.254 %1=0.5198 %5= 0.3429 %10=0.2559	1.344 0.1788	29.793 1.0000	2.753 0.0998
Model3	$\chi^2(2)$= 21.47 0.0000	$\chi^2(2)$= 19.597 0.0001	$\chi^2(116)$= 18220.91 0.0000	5.103 %1=0.5198 %5= 0.3429 %10=0.2559	1.165 0.2441	28.375 1.0000	2.418 0.1227
Model4	$\chi^2(3)$= 21.63 0.0001	$\chi^2(3)$= 21.756 0.0000	$\chi^2(116)$= 19137.93 0.0000	5.462 %1=0.5198 %5= 0.3429 %10=0.2559	1.285 0.1987 0.33	26.912 1.0000	2.202 0.1406
Model5	$\chi^2(3)$= 20.70 0.0001	$\chi^2(3)$= 23.133 0.0000	$\chi^2(116)$= 19450.57 0.0000	5.390 %1=0.5198 %5= 0.3429 %10=0.2559	1.461 0.1439 0.336	29.430 1.0000	2.373 0.1262
Model6	$\chi^2(3)$= 20.56 0.0001	$\chi^2(3)$= 21.691 0.0001	$\chi^2(116)$= 17677.75 0.0000	5.111 %1=0.5198 %5= 0.3429 %10=0.2559	1.277 0.2015 0.334	28.512 1.0000	2.090 0.1510

Firm Level Uncertainty

Table 4a.5- Investigation of the Individual and Time Specific Effect

MODELS	Individual Fixed Effect	Individual Random Effect	Time specific Effect
Accelerator	F(115, 1042) =4.04 Pr = 0.0000	$\chi^2(1) = 239.38$ Pr= 0.0000	F(9, 1148) = 5.89 Pr = 0.0000
Cash-flow	F(115, 1041) = 4.05 Pr = 0.0000	$\chi^2(1) = 237.11$ Pr=0.0000	F(9, 1147) = 5.84 Pr = 0.0000

Table4a.6- Tests Results of the Investment Models Augmented with Firm Uncertainty

MODELS	Hausman Test One way	Sargan-Hansen One way	Wald test for Heterogeneity Two way	Frees Test Two way	Pesaran Test Two way	Friedman Test Two way	Wooldrige Serial Cor.
Accelerator	$\chi^2(2)=$ 18.38 0.0000	$\chi^2(2)=$ 14.786 0.0006	$\chi^2(116)=$ 21431.43 0.0000	5.220.862 %1=0.5198 %5= 0.3429 %10=0.2559	1.239 0.2155	29.853 1.0000	2.455 0.1199
Cash-Flow	χ 2 (2)= 21.08 0.0000	$\chi^2(3)=$ 17.656 0.0005	χ^2 (116)= 22752.78 0.0000	5.370 %1=0.5198 %5= 0.3429 %10=0.2559	1.348 0.1777	28.738 1.0000	2.112 0.1489

APPENDIX 5: SENSITIVITY ANALYSIS

Table5a.1- Estimation Results of the Exchange Rate Uncertainty on Investment Models

	ACCELERATOR			CASH FLOW		
I	Model1	Model2	Model3	Model4	Model5	Model6
NS	0.115991 (.0090)* (.0051)*	0.115991 (.0090)* (.0051)*	0.115991 (.0090)* (.0051)*	0.09644 (.0102)* (.0067)*	0.09644 (.0102)* (.0067)*	0.09644 (.0102)* (.0067)*
NP				.27523 (.0596)* (.0882)*	.27523 (.0596)* (.0882)*	.27523 (.0596)* (.0882)*
GER	0.115612 (.0247)* (.0011)*			0.10710 (.0252)* (.0023)*		
AER		0.0832407 (.0177)* (.0007)*			0.07711 (.0181)* (.0017)*	
SER			0.029509 (.0086)* (.0005)*			0.04167 (.0098)* (.0009)*
R^2	0.2731	0.2731	0.2731	0.2840	0.2840	0.2840
	1117	1117	1117	1075	1075	1075

Table5a.2- Estimation Results of the Real Wage Uncertainty on Investment Models

	ACCELERATOR			CASH FLOW		
I	Model1	Model2	Model3	Model4	Model5	Model6
NS	0.11849 (.0091)* (.0049)*	0.124284 (.00967)* (.00431)*	0.11575 (.00913)* (.00518)*	0.09949 (.0103)* (.0068)*	0.10613 (.0108)* (.0060)*	0.09567 (.0102)* (.0065)*
NP				0.26552 (.0597)* (.0831)*	0.25991 (.0607)* (.0845)*	
GW	0.0045 (.0076) (.0073)			0.00540 (.0075) (.0057)		
AW		0.013107 (.0074)*** (.0051)**			0.01429 (.0076) (.0067)**	
SW			-0.00732 (.0128) (.0042)***			-0.005588 (.0126) (.0066)
R^2	0.2825	0.2988	0.2723	0.3120	0.2842	0.2856
	1096	1056	1115	1014	1074	1054

Table5a.3- Estimation Results of the Firm Specific Uncertainty on Investment Models

I	ACCELERATOR	CASH FLOW
NS	.12278 .01005* .00706*	.09983 .01157* .00767*
NP		.30214 .06502* .11011*
SNS	-2.248e-07 6.982e-08* 4.198e-*	-2.587e-07 7.171e-08* 3.965e-08*
R^2	0.2919	0.3048
obs	1037	999

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