INVESTIGATING OF THE RELATIONSHIP BETWEEN THE PRODUCER PRICE INDEX AND FUTURES PRICES

KEREM AKSOY
106664046

ISTANBUL BILGI UNIVERSITY

INSTITUTE OF SOCIAL SCIENCES

MSc. in International Finance

Supervised by:
OKAN AYBAR

2009

INVESTIGATING OF THE RELATIONSHIP BETWEEN THE PRODUCER PRICE INDEX AND FUTURES PRICES

ÜRETİCİ FİYAT ENDEKSİ İLE VADELİ FİYATLAR ARASINDAKİ

İLİŞKİNİN ARAŞTIRILMASI

KEREM AKSOY
106664046

Okan AYBAR

Prof. Dr. Oral ERDOĞAN

Kenan TATA

Tezin Onaylandığı Tarih

Toplam Sayfa Sayısı

Anahtar Kelimeler (Türkçe)	Anahtar Kelimeler (İngilizce)
1) Riskten Korunma	1) Hedging
2) Vadeli Piyasalar	2) Futures Markets
3) Oynaklık	3) Volatility
4) EGARCH	4) EGARCH
5) Emtia	5) Commodity

ABSTRACT

The paper provides futures market analysis detailed as price, basis risk and volatility analysis of futures contract. In financial series, instead of using linear time series, using nonlinear conditional heteroscedaticity model is becoming widespread because of their characteristic.As a result of this, modelling of volatility with ARCH, GARCH, E-GARCH models and chosing the best models between alternative models are the aims of this study. E-GARCH test is applied for the monthly (close-to-close) PPI (Price Producer Index), soybean price, wheat price, gasoline price, platinum price CBOT (Chicago Board Of Trade) cash settlement prices, from 30th of January, 1998 to 30th of December, 2008 and CRB (Commodity Price Index) from Bloomberg, hedging inflation side asymmetric volatility structure of the PPI is exposed. Besides, the importance of the commodity for Global Economy is emphasized with expressed economic indicators.

Keywords Hedging, Futures Market, Volatility, E-GARCH, Commodity

ÖZET

Bu çalışma da fiyat baz risk ve volatiliteden oluşan kapsamlı bir vadeli piyasa analizi yapılmıştır.Finansal serilerde, taşıdıkları özellikler nedeniyle doğrusal zaman serisi yerine, doğrusal olmayan koşullu değişen varyans modellerinin kullanılması giderek daha yaygın hale gelmiştir.Bu nedenle çalışmada, doğrusal olmayan koşullu değişen varyans modellerinden ARCH, GARCH ve EGARCH modeleri ile volatilitenin modellenmesi ve alternatif modeller arasından en iyi performansı gösteren modelin saptanması amaçlanmıştır. 30 Ocak 1998 den 30 Aralık 2008'e kadar aylık ABD üretici fiyat endeksi rakamları dikkate alınarak EGARCH testi uygulanmış ve üretici fiyat endeksinin vadeli kontratlarla önceden tahmin edilebildiği tespit edilmiştir. Ayrıca emtiaların önemi temel ekonomik göstergelerle vurgulanmıştır.

Anahtar Kelimeler: Riskten korunma, Vadeli Piyasalar, Oynaklık, EGARCH, Emtia

ACKNOWLEDGEMENT

I express sincere appreciation to Okan Aybar for his guidance and insight throughout the research. I feel pleasing to him for his favor in sharing his time, sources and works, as well as for his continued assist, patience and understanding in every step of this study.

I am deeply thankful to assistant professor doctor Cenktan Ozyildirim who advised me regarding the econometrical analysis of the study. Special thanks go to Prof. Dr. Oral Erdogan for his great support. To my friends, I thank them for understanding my frequent absences.

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1. INTRODUCTION

In recent years, there has been a huge growth in the global financial markets. This growth began with deregulation of financial markets and introduction of new financial products. For instance introduction of currency and interest rate swaps were the natural responses to the needs of global and international companies whose number increased theatrically. For the last decade, volatility in both capital markets and equity markets has been high.

Increased regulation of futures trading has been implemented despite the lack of reliable statistical evidence that futures' trading is associated with increased volatility.

Managed futures, as an alternative investment, are not new products for investors to park their money.

Commodity futures markets offer many advantages as well as some disadvantages to investors and portfolio managers. The advantages of commodity futures; Access to numerous investments market; Ease of short selling; Low cost leverage trading; High liquidity; Low correlation with other markets; Inflation hedge possibility.

A commodity is an asset just like any other asset such as stock, bond, and real estate. Because most commodity futures are assets that have either negative or positive correlation to other financial assets they provide a different perspective to asset managers to adjust their portfolio's risk/return relationship.

Managed futures returns generally have low correlation with stock and bond returns. Because of low correlation it is possible to say that portfolio managers can improve their risk by including managed futures in their portfolio.

Futures markets are designed as zero sum game principal and this gives many advantages to investors such as short selling and high leverage trading in highly liquid markets.

Managed futures have some disadvantages besides its advantages. Disadvantages associated with managed futures are; Cost; High volatility; Market capacity; Negative image

The costs that are associated with futures contracts are relatively higher than their stock counterparts.

Another disadvantage of commodity futures may be the degree of volatility compared to other markets volatility and return.

As actively managed portfolios of derivative market instruments, managed futures include investment positions in futures, options, and forward contracts as well as cash positions in the underlying assets.

1.1 General Characteristics of Futures

A futures contract is an agreement between two parties in which one party, the buyer; agrees to buy from the other party, the seller; an underlying asset or other derivative, at a future date at a price agreed on today. Futures contracts are regulated at the federal government level. Futures contracts are created on organized trading facilities referred to as futures exchanges.

In a futures transaction, one party, the long, is the buyer and the other party, the short, is the seller. The buyer agrees to buy the underlying at a later date, the expiration, at a price agreed on at the start of the contract. The seller agrees to sell the underlying to the buyer at the expiration, at the price agreed on at the start of the contract. Every day, the futures contract trades in the market and its price changes in response to new information. Buyers benefit from price increases, and sellers benefit from price decreases. On the expiration day, the contract terminates and no further trading takes place. Then, either the buyer takes delivery of the underlying from the seller, or the two parties make equivalent cash settlement.

1.2 Futures Market Participants

More than 3,600 CBOT members trade at the CBOT, and only these members can trade on the exchange. About 1,400 are full members who have trading access to all of the exchange's contracts. The rest of the members may trade in some subgroup of contracts on the exchange.

Commission brokers are members that transact for clients and other parties and charge a fee for their services. Commission brokers usually direct their trades through floor brokers, who are in business to facilitate trades on the exchange.

Day traders make a living by profiting from buying and selling on the exchange. They take long or short positions in contracts of interest for a single trading period. These traders usually begin the trading session without contract exposure and close positions before the end of the trading session.

Spreaders may be on or off-exchange traders who will go long a given contract of one maturity, and go short the same contract with another maturity. They may also go long one type of contract while simultaneously shorting another. These long-short position pairs allow for lower risk than a one-sided position, but also generate lower potential returns. Lower margin requirements are usually placed on spreaders' positions.

1.3 The Clearing House, Daily Settlement, and Performance

An important and distinguishing feature of futures contracts is that the gains and losses on each party's position are credited and charged on a daily basis. This procedure, called daily settlement or marking to market. It is also equivalent to terminating a contract at the end of each day and reopening it the next day at that settlement price.

1.4 Regulation

In most countries, futures contracts are regulated at the federal government level. In the United States, the Commodity Futures Trading Commission regulates the futures market.[1]

Federal regulation of futures markets generally arises out of a concern to protect the general public and other futures market participants, as well as through recognition that futures markets affect all financial

[1] Robert Kolb;"Understanding Derivatives";1995,pp.103

markets and the economy. Regulations cover such matters as ensuring that prices are reported accurately and in a timely manner, which markets are not manipulated, that professionals who offer their services to the public are qualified and honest, and that disputes are resolved.

1.5 Delivery and Cash Settlement

A futures trader can close out a position before expiration. If the trader holds a long position, she can simply enter into a position to go short the same futures contract. From the clearinghouse's perspective, the trader holds both a long and short position in the same contract. These positions are considered to offset and, therefore, there is no open position in place. Most futures contracts are offset before expiration. Those that remain in place are subject to either delivery or a final cash settlement. Here we explore this process, which determines how a futures contract terminates at expiration.

1.6 Types of Futures Contracts

There are mainly four types of futures contracts. These are commodity futures, foreign currency futures, interest rate futures and index (generally stock index) futures. In addition, there are more than 50 different subcontracts that are currently available in CBOT.[2]

[2] Mc Graw Hill;"The Handbook Of CBOT";2008

1.7 Commodity Futures Contracts

Commodity futures contracts were first used in the agricultural area to protect farmers from the seasonal fluctuations, and to hedge their income. Nowadays it is being used for hedging, speculation and arbitrage purposes.

Parallel to the growth of commodity future markets, the variety of products traded have also expanded. As such, trading of the precious metals as well as the energy derivatives have commenced besides agricultural products.

The primary agricultural products traded include, grains, oil products and cotton. The highest trading volumes among precious metals belong to gold, silver and copper. Energy derivatives are mainly comprised of crude oil, heating oil and gasoline.

For many of these commodities, several different contracts are available for different types of the commodity. For the majority of the commodities, there are various delivery months.

1.8 Interest Rate Futures Contracts

Interest rate futures contact is a type of contract whose underlying security is a debt obligation. These types of contracts are traded on Treasury bills, notes, and bonds, as well as Eurodollar deposits, and municipal bonds. There are two contracts with three-month maturities being traded on CME, namely T-bills and Eurodollar time deposits.

Interest rate futures contracts can be used by hedgers, speculators and arbitrageurs. Trader having T-bills, notes and bonds on their portfolios may use interest rate futures for hedging purposes. Likewise, investors who are willing to make profits due to seize the interest rate fluctuations can also use the interest rate futures to seize arbitrage opportunities.

1.9 Foreign Exchange Futures Contracts

Active trading of foreign exchange futures have started with the establishment of the floating exchange rate regimes in the early 1970s.Firstly, foreign exchange futures were designed to protect both exporters and importers from the currency fluctuations. As the market developed, it has become an attractive instrument for speculators and arbitrageurs, as well. Foreign exchange futures contracts are mostly denominated on the British pound, U.S. dollar, Canadian dollar, Euro, the Japanese yen, and the Swiss francs

1.10 Index Futures Contracts

Most of the future contracts include stock indices. One of the most remarkable characteristic about stock index futures contracts is that there is no possibility of actual delivery. A trader's obligation must be fulfilled by a reversing trade or a cash settlement at the end of trading. These contracts mostly used for making profits with speculative actions. To some extent hedgers are also using these contracts but not as much as speculators do.

1.11 Hedging

Hedging, the other major economic purpose of futures markets is buying or selling futures contracts to offset the risks of changing prices in the cash markets. This risk-transfer mechanism makes futures contracts extremely useful tools for controlling costs and protecting profit margins.

The economic principles that apply to traditional commodity futures contracts, such as wheat futures, also apply to financial contracts such as currencies, stock indexes, and government debt.

Other users of financial futures contracts include commercial and investment bankers, corporate treasurers, state and local government officers, portfolio and money managers, mortgage bankers, pension and trust fund managers, and insurance companies.

In all hedging strategies, the common denominator is the desire to establish, in advance, an acceptable price. Every business, regardless of whether it performs a service or manufactures a product, faces some type of financial risk

1.12 Margin

To minimize the risk of a contract default ever happening, Exchange clearinghouses require their members to deposit performance bond Money called margins, just as clearing members require margins from their customers.

Margins are good-faith deposits required of both buyers and sellers to ensure fulfillment of these contract obligations.

Margins are determined on the basis of market risk. As such, they help preserve the financial soundness of futures exchanges and provide valuable price protection for hedgers with a minimum tie-up of capital.

Margins are normally set at 2 to 5 percent of the value of the commodity or financial instrument represented by a futures contract.

1.13 Why Trade A Futures Contract

There are several reasons to trade a futures contract, including liquidity, transparency, and leverage.

1.14 Liquidity

A key benefit of futures trading is liquidity. Liquid markets easily match a buyer with a seller, enabling traders to quickly transact their business at a fair price.

Some beginning traders often equate liquidity with trading volume, concluding that only markets with the highest actual volume of contracts traded are the most liquid. While this holds true in many markets, with the advent of electronic trading, exchanges can provide substantially more liquidity, or opportunity to trade, than the actual number of contracts traded.

1.15 Transparency

Many futures markets such as those at the CBOT are considered to be “transparent” because the order flow is open and easily observable. When an order enters the marketplace, the order fills at the best price for the customer. With the advent of electronic trading, transparency has reached new heights because all transactions can be viewed online in real time.

1.16 Leverage

For speculators, hedgers, and other traders, a key benefit of trading in the futures markets is that it offers financial leverage. Leverage is the ability of a trader to control large dollar amounts of a commodity with a comparatively small amount of capital. Leverage is possible because of margin. Rather than pay for the full value of the contract (as one would in a cash transaction) or pay margin rates as high as 50 percent (as one would in a stock transaction), futures margin amounts require a trader to post a fraction of those amounts. As such, leverage magnifies both gains and losses in the futures markets.

1.17 Futures Markets in Turkey

In Turkey, the first futures contracts were introduced by Istanbul Stock Exchange (ISE) in 2001. However, the first futures trading trial ended in a very short time because of the insufficient substructure. Afterwards, on February 4 2005, Turkish Derivatives Exchange (TurkDEX) has commenced. By the commencement of TurkDEX, futures trading officially started in Turkey.[3]

Initially, only ISE-30 index, TRY/DOLLAR and TRY/EURO currency futures contracts were introduced.

1.18 2008 Commodity Performance

No asset class has experienced a roller-coaster ride like commodities have in 2008. Below is a table with the performance of ten major

[3] Turkish Derivatives Exchange,www.turkdex.org.tr

commodities over the last year. For each commodity, we highlight its current year-to-date change, its drop from its 52-week high, and its performance from the start of the year to its 52-week high.

As shown, oil has fallen the most from its highs at -75%. Oil is trailed by copper (-70%), platinum (-61%), and natural gas (-57%). Oil is also the commodity that is down the most year to date at -62%. Of the ten commodities highlighted, gold is the only one that remains up on the year with a gain of 3.87%.

The crazy thing is that these commodities looked to be headed towards record positive years just a few months ago. At its peak, natural gas was up 83% on the year, but it is now down 22% in 2008. Oil was up 53% for the year before falling more than $100 from its highs.

As hectic as the stock market has been this year, commodities have been even more volatile.[4]

2008 could be seen as the year in which the "great divorce" between gold and price of other commodities occurred as the slump in global GDP growth hit the industrial demand for commodities at the same time as financial crises elevated gold's haven appeal. The base metals, for example, were generally weak, with the annual average copper price down a modest 2% and the zinc price down a hefty 42%.

It was this weakness in industrial demand that no doubt helps explain why silver could not keep pace with gold, but it still managed a 12% rise in the average, highlighting its hybrid nature of precious and industrial

[4] See, Appendix Figure 1 and Figure 2

qualities. At first glance, it might appear that platinum behaved similarly to gold, with its 21% rise in the annual average. However, that was very much a product of first quarter supply issues and that metal suffered a dramatic 42% intra-year fall as auto catalyst demand contracted.

Oil might also appear to show a fair similarity to gold as its annual average price rose by a little over a third. However, its trajectory was quite different in that prices rose in a comparatively straight line fashion through to early July but then silt relentlessly as demand fell away, generating a 53% intra-year price slump.

2008 was perhaps one of the most volatile years for the prices of commodities. Tight fundamentals, due to a period of robust world economic growth and chronic supply constraints, coupled with a downward trending dollar, geopolitical tensions and a rise in speculative activity drove numerous commodity prices to fresh record highs in the first half. The precipitous run up in prices, along with fears over longer term issues of "food security" and "peak oil" were so pronounced that food and fuel riots erupted across some parts of the world.

It is worth stressing here that the impact of the trend reversal in the dollar in the second half of 2008 is not to be overlooked. A great deal of the positions built up in commodities over recent years was financed by short positions in the dollar, as well as the yen. Funds were effectively borrowed in these low yielding currencies and the proceeds invested in higher yielding assets, such commodities, emerging market equities, and other currencies.

The rest of this paper is organized as follows; section II sets out the widespread literature review covering the basic concepts through the aim of the paper; future management, determination of optimal hedging strategies, basis risk, significance of volatility and the asymmetry in volatility with E-GARCH econometric model. And section III data and methodology. Next, section IV, addition to the historical volatility analysis, E-GARCH test is applied to set out the volatility structure of PPI. In this section IV proves the empirical evidence for USA PPI replicating, and volatility analysis of the hedge against inflation. Then, section V realizes a comprehensive conclusion. And finally, section VI is for references while section VII takes place as appendix.

2. LITERATURE REVIEW

After the introduction of managed futures, futures contracts has become one of the most popular financial instruments because of their positive effects not only on the financial markets but also on the economy. As it is mentioned in the introduction part, their positive effects are basically; altering the risk management schemes of institutional investors, making asset management strategy more active and providing diversification for both the investors and financial institutions which are important for financial markets to come close to the completeness.

As futures contracts became popular in U.S.A. other countries started to introduce futures contracts in their financial markets. Accordingly, futures transactions reached huge volumes all over the world. Albeit the positive sides, there has been always questions and doubts about its effects on the underlying spot market.

Jones, Et-Al (1994) shows that the volatility-volume relation typically disappears when the relation between volatility and the number of transactions is controlled[5]. He states that daily volatility is significantly positively related to both average daily trade size and number of daily transactions.

Benjamin H. Cohen (1999) observed ratios of the variances of multi-day and daily price movements for both bond prices (In U.S.A.) and stock

[5] Jones, Charles, Guatam Kaul and Marc L. Lipson; "Transactions, Volume and Volatility" ; The Review of Financial Studies; 1994

indices (In U.S.A) As a result he found no evidence that futures increased volatility of the underlying spot markets.

A. Hogson and D. Nicholls (1991) studied the impact of All Ordinaries Shares Index futures on the All Ordinaries Share Index in spot market. He estimated a standard deviation of daily and weekly returns to measure the change in the volatilities of underlying index. The results indicated that the introduction of futures trading has not affected the volatility of underlying index.

Hendrik Bessembinder and Paul J. Seguin (1992) also examined U.S. S&P 500 spot index to see the relations between spot and futures trading activity and volatility in equity markets. They made a variance analysis and they could not find any evidence supporting the fact that futures trading caused any increase on spot market volatility.

Andreas Pericli and Gregory Koutmos (1994) conducted a similar analysis to examine the impact of U.S. S&P 500 index futures and options contracts on the volatility of underlying spot market by using an EGARCH model. Their evidence reported that both index futures and options contracts had no escalating effect on the spot market volatility.

A number of studies have examined of futures, with the results varying widely by study. Studies by Bodie (1983), Irwin and Brorsen (1985) and Irwin and Landa (1987) support the view the managed futures produce favorable or appropriate investment returns. In contrast Elton, Gruber and Rentzler (1987, 1990) found that managed futures were generally poor investment on a portfolio basis.

Common, justification for including commodity futures in a portfolio is the view that they provide an inflation hedge. As commodity prices increase during an inflationary period, long positions in commodity futures benefit, while security returns tend to be impacted adversely. Real estate and T-bills also are proposed frequently as inflation hedges. We also include real estate and T-bills to examine the marginal inflation-hedging benefits commodity futures provide beyond those provided by real estate and T-bills. Elton, Gruber, and Rentzler (1987) found evidence refuting the effectiveness of futures as an inflation hedge. The differing results against the Bodie, Edwards & Park and Irwin Landa may be due to the observation that their study concentrated on a hyper-inflationary period (1979–1985) and employed monthly returns.

Bodie (1979), Hanke and Culp (1992) managed simple study to examine whether commodity futures can be used as a hedge against inflation. They have two assumptions was as follows[6]:

Futures are not assets but the spot commodities on which futures contract are based are assets.

If the assets that are positively related to inflation are held in the form of futures contracts.

However these assumptions against Gerald D. Gay and Steven Manaster (1982) the assets that are the negative related to inflation are held in the form of futures contracts.

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[6] Bodie, Zvi;"Commodity Futures As A Hedge Against Inflation";The Journal Of Portfolio Management;1983

Zvi Bodie's examined hedge against inflation in both inflation and disinflation periods. Through a mean returns and variance model, it examines sector specific future indices and studies their correlation with inflation in comparison with individual commodity futures.

Gerald Gay and Steven Manaster also examined to form portfolios of stocks and U.S Treasury Bills that hedge against price changes of various commodities. This approach differs from Bodie'a studies on hedging because they strive to hedge against price changes in individual commodities, not macro aggregates. Besides, the results of this study have implications for inflation hedging strategies, the role of futures markets as a hedge against inflation, and the practical relevant of asset pricing models that rely on the supposed influence of specific commodity prices on asset returns.

Ukpond, Leo Udo examined to investigate the relationship between U.S domestic monetary and commodity price index. Especially, the objective of research and tests how gasoline, heating oil and crude oil prices are affected by U.S monetary policy. It is hypothesized that market's perception of monetary policy announcements will affect investors' wealth through expected change in inflation.

Accordingly Ball (1964), commodity prices, along with anticipated rates of inflation, must adjust, therefore, to unique levels.

Leffer and Zecher (1970) analyzed the annual changes Commodity Price Index from 1900 to 1963 and concluded that observed serial dependence in the index changes was small enough to imply efficient commodity markets. Results of this research do not support Laffer's and Zecher's conclusion that commodity markets are efficient because the first lagged annual rate of change in each commodity price index is a significant explanatory variable.

Sargent (1969) examined the annual changes Commodity Price Index and the other variables Real Money Supply. For this purpose, conclusion of this research that commodity market are efficient.

Lin, Joungyol examines the hedging performance of commodity futures against inflation. The statistical analysis indicates that none of the rates of returns on either cash holdings or futures contracts with various contract durations provides a good hedge against expected inflation. However, the rates of returns on silver and copper future contracts provide a good hedge against unexpected inflation.

A number of studies have examined the performance of futures, with the results varying widely by study. Studies by Bodie (1983), Irwin and Brorsen(1985), Brorsen and Irwin (1985), and Irwin and Landa (1987) support the view that managed futures produce favorable or appropriate investment returns. In contrast, Elton, Gruber, and Rentzler (1987, 1990) found that managed futures were generally a poor investment on a portfolio basis.

Several studies also reported mixed evidence, with the results depending on the type of futures investment and the period examined (see Edwards & Liew, 1999; Edwards & Park, 1996; Irwin, Krukemyer,& Zulauf, 1993; Schneeweis, Savanayana, & McCarthy, 1991). Irwin etal.

(1987) noted that commodity pools provided attractive returns in the late 1970s, while Edwards and Park (1996) showed that managed futures generally performed poorly in the 1989 to 1992 period. Interestingly, Edwards and Liew (1999) found that passive commodity indexes were not substitutes for managed commodity funds in diversified portfolios during the 1982 to 1996 period. However, the authors note that it is unrealistic to believe that investors could replicate the holdings and necessary rebalancing of all managed futures pools to achieve the investment returns found in the study.

3. DATA AND METHODOLOGY

In the financial market analysis, volatility has always been one of the most important research issues. Thus, numerous econometric models have been developed to estimate and examine the volatilities of financial time series.

The class of ARCH models allows us to estimate time varying conditional variance. Generalized ARCH (GARCH) models include lags of the conditional variance to estimate the conditional variance of the model. Nelson (1991) proposes an extended version of such models: EGARCH. EGARCH method is more advantageous than both ARCH and GARCH methods.

3.1 Data

Trading of futures contracts in USA began on July 1848.All of futures contracts is examined in this study. Monthly closing prices for the all of futures contracts are used over the period January 1998 to December 2008. On the other hand, monthly closing prices for the PPI index are used over the period January 1998 to December 2008. Closing prices for PPI index and CRB (Commodity Research Bureau) were obtained from the data base of Bloomberg and Reuters. On the other hand, for all of futures contracts, closing prices were obtained from the data base of Reuters.

In the data section, it is also important to investigate the descriptive statistic results of correlation between the all of the independent variables. The reason for investigating the descriptive statistics is to see if the data set is cointegrated or not. Table 7 shows that the results of cointegration test all variable is stationary[7] and cointegrated for the first differences.[8]

First of all, Augmented Dickey Fuller Unit Root Test applied to each financial series. Accordingly Augmented Dickey Fuller Unit Root Test all of series is non stationary. Series by taking first differences to make them all stationary test was applied. And then, estimated the model with OLS. This model have an autocorrelation[9]. I took the logarithm of each financial series for autocorrelation. As a result of, all of coefficient is significant.

When VAR (1, 1) and VAR (1, 2) test applied to this model[10]. I choose the VAR (1, 1) model according to Shwartz criteria.

Since the series is stationary, we can apply E-GARCH[11] in order to set out the volatility structure of PPI index. The EGARCH (Nelson 1991)[12] specifies conditional variance in logarithmic form, which means that there is no need to impose estimation constraint in order to avoid negative variance.

3.2 Time Series

Time series arise as recordings of processes which vary over time. A recording can either be a continuous trace or a set of discrete observations.

There are a number of things which are of interest in time series analysis. The most important of these are:

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[7] See Appendix Table 1, 2, 3, 4, 5, 6
[8] See Appendix Johanson test
[9] See Appendix Table 8
[10] See appendix Table 9
[11] See Appendix Table 10
[12] Gujarati, Econometrics, 1995

Smoothing The observed Y_t are assumed to be the result of "noise" values" ε_t additively contaminating a smooth signal μ_t

$$Y_t = \mu_t + \varepsilon_t$$

We may wish to recover the values of the underlying μ_t

Modeling We may wish to develop a simple mathematical model which explains the observed pattern of $Y_1, Y_2, \ldots, Y_T$. This model may depend on unknown parameters and these will need to be estimated.

Forecasting On the basis of observations $Y_1, Y_2, \ldots, Y_T$, we may wish to predict what the value of Y_{T+L} will be ($L \geq 1$), and possibly to give an indication of what the uncertainty is in the prediction.

Control We may wish to intervene with the process which is producing the Y_t values in such a way that the future values are altered to produce a favorable outcome.

3.3 Stationary and Non-Stationary

A key idea in time series is that of stationary. Stationary series have a rich theory and their behavior is well understood.

Obviously, not all time series that we encounter are stationary. Indeed, no stationary series tend to be the rule rather than the exception. However, many time series are related in simple ways to series which are stationary. Two important examples of this are:

Trend models The series we observe is the sum of a deterministic trend series and a stationary noise series. A simple example is the linear trend model:

$$Y_t = \beta_0 + \beta_1 t + \varepsilon_t \ .$$

Another common trend model assumes that the series is the sum of a periodic "seasonal" effect and stationary noise. There are many other variations.

Integrated models The time series we observe satisfies

$$Y_{t+1} - Y_t = \varepsilon_{t+1}$$

Where ε_t is a stationary series. A particularly important model of this kind is the random walk. In that case, the ε_t values are independent "shocks" which perturb the current state Y_t by an amount ε_{t+1} to produce a new state Y_{t+1}.

3.4 Time Series Theory

We will assume that the time series values we observe are the realizations of random variables $Y_1, Y_2, \ldots, Y_T$, which are in turn part of a larger stochastic process $\{Y_t : t \in \mathrm{Z}\}$. It is this underlying process that will be the focus for our theoretical development.

Although it is best to distinguish the observed time series from the underlying stochastic process, the distinction is usually blurred and the term time series is used to refer to both the observations and the underlying process which generates them.

The mean and the variance of random variables have a special place in the theory of statistics. In time series analysis, the analogs of these are the mean function and the auto covariance function.

There are two common definitions of stationary.

a. Strict Stationary A time series $\{Y_t : t \in Z\}$ is said to be strictly stationary if for any k > 0 and any $t_1, \ldots, t_k \in$ Z, the distribution of

$$Y_{t_1}, \ldots, Y_{t_k}$$

is the same as that for

$$Y_{t_1+u}, \ldots, Y_{t_k+u},$$

For the every value of u.

This definition says that the stochastic behavior of the process does not change through time. If Yt is stationary then

$$\mu(t) = \mu(0)$$

and

$$\gamma(s, t) = \gamma(s - t, 0).$$

So for stationary series, the mean function is constant and the auto covariance function depends only on the time-lag between the two values for which the covariance is being computed.

These two restrictions on the mean and covariance functions are enough for a reasonable amount of theory to be developed. Because of this a less restrictive definition of stationary is often used in place of strict stationary.

b. Weak Stationary A time series is said to be weakly, wide-sense or covariance stationary if $E|Yt|^2 < \infty$, μ(t) = μ and γ (t + u, t) = γ (u, 0) for all t and u.

In the case of Gaussian time series, the two definitions of stationary are equivalent. This is because the finite dimensional distributions of the time series are completely characterized by the mean and covariance functions.

When time series are stationary it is possible to simplify the parameterization of the mean and auto covariance functions. In this case we can define the mean of the series to be $\mu = E\ (Y_t)$ and the auto covariance function to be $\gamma\ (u)$ = cov (Y_{t+u}, Y_t). We will also have occasion to examine the autocorrelation function

$$\rho(u) = \frac{\lambda(u)}{\gamma(0)} = cor(\ Y_{t+u}, Y_t\ ).$$

3.5 White Noise

The white noise process is the basic building block used in most other time series models.It is characterized by a zero mean, a constant variance, and no autocorrelation.

3.6 Autoregressive Series

AR (1), in some detail in order to understand the basic concepts of autoregressive processes.The process is assumed to have a zero mean but it is straightforward to put in any mean or trend.

If Y_t satisfies $Y_t = \phi_1 Y_{t-1} + \ldots + \phi_P Y_{t-p} + \varepsilon_t$

Where ε_t is white-noise and the ϕ_u are constants, then Y_t is called an autoregressive series of order *p*, denoted by AR (p).

Autoregressive series are important because[13]:

1. They have a natural interpretation the next value observed is a slight perturbation of a simple function of the most recent observations.

2. It is easy to estimate their parameters. It can be done with Standard regression software.

3. They are easy to forecast. Again standard regression software will do the job.

3.6.1 The AR (1) Series

The AR (1) series is defined by

$$Y_t = \phi\, Y_{t-1} + \varepsilon_t.$$

Because Y_{t-1} and ε_t are uncorrelated, the variance of this series is

$$Var\,(Y_t) = \phi^2\, var\,(Y_{t-1}) + \sigma_\varepsilon^2$$

If $\{Y_t\}$ is stationary then $var\,(Y_t) = var\,(Y_{t-1}) = \sigma_y^2$ and so

$$\sigma_y^2 = \phi^2\, \sigma_y^2 + \sigma_\varepsilon^2.$$

This implies that $\sigma_y^2 > \phi^2\, \sigma_y^2$ and hence $1 > \phi^2$ If we multiply both sides of equation by Y_{t-u} and take expectations we obtain

[13] Chris Brooks, Introductory Econometrics for Finance, Cambridge University Press, 2002

$$E\,(Y_t\,Y_{t-u}) = \phi E\,(\,Y_{t-1}\,Y_{t-u}) + E\,(\varepsilon_t\,Y_{t-u})$$

The term on the right is zero because, from the linear process representation, ε_t is independent of earlier Y_t values. This means that the autocovariances must satisfy the recursion.

$$\gamma\ (u) = \phi\ \gamma\ (u\text{-}1), \qquad u = 1, 2, 3,$$

This is a first-order linear difference equation with solution

$$\gamma\ (u) = \phi^u\ \gamma\ (0)$$

By rearranging equation we find $\gamma\ (0) = \sigma_\varepsilon^2 / (1\text{-}\ \phi^2\ )$ and hence that

$$\gamma\ (u) = \frac{\phi^u \sigma_\varepsilon^2}{1-\phi^2} \quad , \quad u = 0, 1, 2,$$

This in turn means that the autocorrelation function is given by

$$P\ (u) = \phi^u\ , \qquad u = 0, 1, 2,$$

3.7 Moving Average Series

A time series $\{Y_t\}$ which satisfies

$$Y_t = \varepsilon_t + \theta_1\,\varepsilon_{t-1} + \ldots + \theta_q\,\varepsilon_{t-q} \quad (\text{with } \varepsilon_t \text{ white noise})$$

is said to be a *moving average process of order q* or *MA (q) process*. No additional conditions are required to ensure stationary.

Which says there is only a finite span of dependence on the series.

Note that it is easy to distinguish MA and AR series by the behavior of their autocorrelation functions. The act for MA series "cuts off" sharply while that for an AR series decays exponentially (with a possible sinusoidal ripple superimposed).

3.8 Autoregressive Moving Average Series

If a series satisfies, *(with* ε_t *white noise)* $Y_t = \phi_1 Y_{t-1} + \ldots +$ $\phi_P Y_{t-p} + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \ldots + \theta_q \varepsilon_{t-q}$ it is called an *autoregressive-moving average series of order (p, q)*, or an *ARMA (p, q) series*.

An ARMA *(p, q)* series is stationary if the roots of the polynomial $1- \phi_1 Z - \ldots - \phi_p z^p$ lie outside the unit circle

3.9 The ARMA*(p,q)* Model

It is possible to make general statements about the behavior of general ARMA *(p, q)* series. When values are more than *q* time units apart, the memory of the moving average part of the series is lost. The functions γ *(u)* and ρ *(u)* will then behave very similarly to those for the AR *(p)* series

$$Y_t = \phi_1 Y_{t-1} + \ldots + \phi_P Y_{t-p} + \varepsilon_t$$

For large *u*, but the first few terms will exhibit additional structure

3.10 The Partial Autocorrelation Function

The autocorrelation function of an MA series exhibits different behavior from that of AR and general ARMA series. The act of an MA series cuts of sharply whereas those for AR and ARMA series exhibit exponential decay (with possible sinusoidal behavior superimposed). This makes it possible to identify an ARMA series as being a purely MA one just by plotting its autocorrelation function.

The partial autocorrelation function provides a similar way of identifying a series as a purely AR one.

Given a stretch of time series values

$$. . . , Y_{t-u}, Y_{t-u+1}, . . . , Y_{t-1}, Y_t, . . .$$

The partial correlation of Y_t and Y_{t-u} is the correlation between these random variables which is not conveyed through the intervening values.

3.10.1 Vector Autoregressive Models Compared with Structural Equations Models

Advantages of VAR Modelling

- Do not need to specify which variables are endogenous or exogenous all are endogenous
- Allows the value of a variable to depend on more than just its own lags or combinations of white noise terms, so more general than ARMA modelling
- Provided that there are no contemporaneous terms on the right hand side of the equations, can simply use OLS separately on each equation
- Forecasts are often better than "traditional structural" models.

Problems with VAR's

- VAR's are a-theoretical (as are ARMA models)
- How do you decide the appropriate lag length?

- So many parameters! If we have g equations for g variables and we have k lags of each of the variables in each equation, we have to estimate $(g+kg^2)$ parameters. E.g. g=3, k=3, parameters = 30

3.11 Cointegration

In most cases, if we combine two variables which are I(1), then the combination will also be I(1).More generally, if we combine variables with differing orders of integration, the combination will have an order of integration equal to the largest. i.e., if $X_{i,t} \sim I(d_i)$ for i =1,2,3,...,k so we have k variables each integrated of order d_i.

Let $z_t = \sum_{i=1}^{k} \alpha_i X_{i,t}$ .Then $z_t \sim$ I (max d_i)

Rearranging equation, we can write $X_{1,t} = \sum_{i=2}^{k} \beta_i X_{i,t} + z'_t$ where $\beta_i = -\frac{\alpha_i}{\alpha_1}$, $z'_t = \frac{z_t}{\alpha_1}$, $i = 2, \ldots, k$ .This is just a regression equation.

But the disturbances would have some very undesirable properties: z_t' is not stationary and is auto correlated if all of the X_i is I (1).

Let $\mathbf{z}_t$ be a $k \times 1$ vector of variables, then the components of z_t are cointegrated of order (d,b) if all components of $\mathbf{z}_t$ are I(d).There is at least one vector of coefficients α such that $\alpha' z_t \sim$ I(d-b)

Many time series are non-stationary but "move together" over time. If variables are cointegrated, it means that a linear combination of them will be stationary. There may be up to r linearly independent cointegrating relationships (where $r \leq k$-1), also known as cointegrating vectors. r is also known as the cointegrating rank of z_t.A cointegrating relationship may also be seen as a long term relationship.

3.12 ARCH

3.12.1 Heteroskedasticity

Time-variation in volatility (heteroskedasticity) is a common feature of macroeconomic and financial data. The perhaps most straightforward way to gauge it is to estimate a time-series of variances on "rolling samples." For a zero-mean variable, ut, this could mean

$$\sigma_t^2 = (u_{t-1}^2 + u_{t-2}^2 + . . . + u_{t-p}^2) / q$$

Where the latest q observations are used. Notice that σ_t^2 depends on lagged information, and could therefore be thought of as the prediction (made in $t - 1$) of the volatility in t.

Unfortunately, this method can produce quite abrupt changes in the estimate. An alternative is therefore to use an exponential moving average (EMA) estimator of volatility,

Which uses all data points since the beginning of the sample but where recent observations carry larger weights? The weight for lag s be $(1 - \lambda)\ \lambda^s$ where $0 < \lambda < 1$, so

$$\sigma_t^2 = (1 - \lambda)\ (u_{t-1}^2 + \lambda\ u_{t-2}^2 + \lambda^2\ u_{t-3}^2 + . . .),$$

Which can also be calculated in a recursive fashion as?

$$\sigma_t^2 = (1-\lambda)\ u_{t-1}^2 + \lambda\ \sigma_{t-1}^2$$

3.12.2 Autoregressive Conditional Heteroskedasticity (ARCH)

Autoregressive heteroskedasticity is another special form of heteroskedasticity and it is often found in financial data which shows volatility clustering.

To test for ARCH features, Engle's test of ARCH is perhaps the most straightforward. It amounts to running an AR *(q)* regression of the squared zero-mean variable (here denoted u_t)

$$u_t = a_0 + a_1 u_{t-1}^2 + \ldots + a_q u_{t-q}^2 + v_t$$

3.13 The EGARCH Model

Suggested by Nelson (1991). The variance equation is given by[14]

$$\log(\sigma_t^{\ 2}) = \omega + \beta \log(\sigma_{t-1}^{\ 2}) + \gamma \frac{u_{t-1}}{\sqrt{\sigma_{t-1}^{\ 2}}} + \alpha \left[\frac{|u_{t-1}|}{\sqrt{\sigma_{t-1}^{\ 2}}} - \sqrt{\frac{2}{\pi}} \right]$$

Advantages of the model

- Since we model the log (σ_t^2), then even if the parameters are negative, σ_t^2 will be positive.
- We can account for the leverage effect: if the relationship between volatility and returns is negative, γ will be negative.

[14] Chris Brooks, Introductory Econometrics for Finance, Cambridge University, 2002

4. FINDINGS

Econometric studies form the basis in this study. In the data section, it is also important to investigate the descriptive statistic results of correlation between the all of the independent variables. Primarily, stableness of future contracts are investigated with ADF test and the test results have been appointed that independent variables has not unit root in other words they are stable.

Table 1: Augmented Dickey Fuller Unit Root Test on D (PPI)

		t-statistic	Prob
Augmented Dickey Fuller Test Statistic		-6.597383	0.0000
Test Critical values	**1 % level**	-3.481623	
	5 % level	-2.883930	
	10 % level	-2.578788	

As can be seen above all of series by taking first differences to make them all stationary test was applied. Subsequently estimated in this study with OLS.

Table 2: OLS Estimation Output

R-squared	0.958152	**Mean dependent var**	146.6108
Adjusted R-squared	0.956111	**S.D. dependent var**	20.76622
Durbin-Watson stat	0.601782	**Prob(F-statistic)**	0.000000

As can be seen above coefficients are meaningful collectively. Because Prob (F-statistic) is smaller than 0.05 signifance level. In this model the correlation in question is a fake for Durbin Watson stat is smaller than adjusted R-squared. To resolve this situation I took the logarithm of each series.

Table 3: OLS Estimation Output

R-squared	0.160283	**Mean dependent var**	0.003073
Adjusted R-squared	0.118985	**S.D. dependent var**	0.012203
Durbin-Watson stat	1.880406	**Prob(F-statistic)**	0.001398

When VAR (1, 1) and VAR (1, 2) test applied to in this study[15]. I choose the VAR (1, 1) model according to Shwarz criteria.

Table 4: VAR Estimation

Akaike information criteria	78.21972
Shwarz criteria	80.55927

Akaike information criteria	78.92335
Shwarz criteria	80.16502

Next, I created AR (1), MA (1) and AR (1) MA (1) processes in order. I choose AR (1) process according to Shwarz criteria.

Table 5: AR (1) Process

Variable	**Coefficient**	**Standard Error**	**t-statistic**	**Prob.**
C	0.002526	0.001677	1.506215	0.1345
AR(1)	0.351263	0.089423	3.928121	0.0001
R squared	0.108335	Shwarz Criterion	**-5.891240**	
Adjusted R squared	0.101314	Prob (F-Stat)	0.000140	

Table 6: AR (1) MA (1) Process

Variable	Coefficient	Standard Error	t-statistic	Prob.
C	0.002432	0.001870	1.300142	0.1959
AR(1)	0.516611	0.258801	1.996172	0.0480
MA(1)	-0.178529	0.277146	-0.644169	0.5206
Shwarz Criterion	**-5.586392**	Prob (F-Stat)	0.000610	

Subsequently in this study estimated with E-Garch method. These series have ARCH effect because of this reason conditional heteroscedasticity models ARCH (1), GARCH (1, 1), EGARCH (1, 1) has been predicted and it has been dedicated that the best model between these models is EGARCH (1, 1).

5. CONCLUSION

In this study, the impact of the futures markets on the Producer Price Index is examined. It is a well-known fact that the aim of the futures markets is to hedge the expected risk. In recent years, volatility in both capital markets and equity markets has been high.

Economical and social expectations gave rise to increase the volatility of prices in many financial assets particularly for uncertainty period. Because of the high volatility some of investors have achieved important gains but some investors give significant losses. In financial series, instead of using linear time series, using nonlinear conditional heteroscedasticity model is becoming widespread because of their characteristic.

According to the econometric Eviews software program has achieved replicating PPI. On the other hand, table 17 shows that we test the volatility structure of PPI index with E-GARCH (Nelson, 1991) and prove that as expected a negative shock prompt the volatility more than a positive shock. My model has asymmetrical structure. According to this study, when the inflation is lower at the same time volatility is lower.

Asymmetrical structure is very important features for this study. This structure is great special feature for arbitragers. Furthermore arbitragers are very good estimate look at the asymmetrical structure. This characteristic, which also confirms the fact that the future market is subject to speculative trade is important in order to explicate the historical volatility throughout constructing the optimal hedging strategy. Further researches should focus on the other future prices in order to revise and modify according to the new financial instrument.

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7. APPENDIX:

Table 7: Augmented Dickey Fuller Unit Root Test on D (PPI)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.597383	0.0000
Test critical values:	1% level	-3.481623	
	5% level	-2.883930	
	10% level	-2.578788	

Table 8: Augmented Dickey Fuller Unit Root Test on D (CRB)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-14.74022	0.0000
Test critical values:	1% level	-3.482035	
	5% level	-2.884109	
	10% level	-2.578884	

Table 9: Augmented Dickey Fuller Unit Root Test on D (DOW)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.69855	0.0000
Test critical values:	1% level	-3.481217	
	5% level	-2.883753	
	10% level	-2.578694	

Table 10 : Augmented Dickey Fuller Unit Root Test on D (GASO)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.352011	0.0000
Test critical values:	1% level	-3.481217	
	5% level	-2.883753	
	10% level	-2.578694	

Table 11 : Augmented Dickey Fuller Unit Root Test on D (PLAT)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.819862	0.0000
Test critical values:	1% level	-3.484198	
	5% level	-2.885051	
	10% level	-2.579386	

Table 12 : Augmented Dickey Fuller Unit Root Test on D (SYBN)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.093560	0.0000
Test critical values:	1% level	-3.482453	
	5% level	-2.884291	
	10% level	-2.578981	

Table 13 : OLS Estimation Output

Dependent Variable: PPI
Method: Least Squares
Date: 01/12/09 Time: 00:42
Sample (adjusted): 1998M01 2008M10
Included observations: 130 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CRB	0.062889	0.015094	4.166446	0.0001
DOW	-1.47E-05	0.000414	-0.035530	0.9717
GASO	0.000697	4.91E-05	14.18565	0.0000
PLAT	-0.001210	0.004056	-0.298364	0.7659
SYBN	-0.008133	0.003824	-2.127142	0.0354
WHEAT	0.002154	0.005620	0.383353	0.7021
C	107.3986	3.971365	27.04324	0.0000

R-squared	0.958152	Mean dependent var	146.6108
Adjusted R-squared	0.956111	S.D. dependent var	20.76622
S.E. of regression	4.350483	Akaike info criterion	5.830793
Sum squared resid	2327.984	Schwarz criterion	5.985199
Log likelihood	-372.0015	F-statistic	469.3674
Durbin-Watson stat	0.601782	Prob(F-statistic)	0.000000

Figure 1 : Graph of RESID01

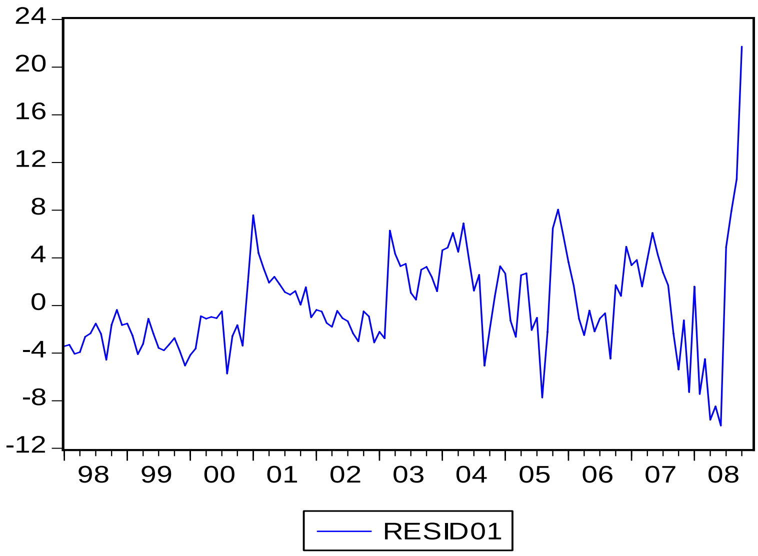


Table 14: Vector Auto regression Estimates

Determinant resid covariance (dof adj.)	1.02E+25
Determinant resid covariance	4.27E+24
Log likelihood	-4901.062
Akaike information criterion	78.21972
Schwarz criterion	80.55927

Determinant resid covariance (dof adj.)	2.93E+25
Determinant resid covariance	1.87E+25
Log likelihood	-5034.569
Akaike information criterion	78.92355
Schwarz criterion	80.16502

Table 15: Johansen Cointegration Test

Date: 01/12/09 Time: 00:49
Sample (adjusted): 1998M03 2008M10
Included observations: 128 after adjustments
Trend assumption: Linear deterministic trend
Series: PPI CRB DOW SYBN GASO WHEAT PLAT
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.429105	205.9842	125.6154	0.0000
At most 1 *	0.387570	134.2338	95.75366	0.0000
At most 2 *	0.164434	71.47277	69.81889	0.0367
At most 3 *	0.145821	48.47805	47.85613	0.0436
At most 4	0.126065	28.30339	29.79707	0.0736
At most 5	0.073650	11.05555	15.49471	0.2081
At most 6	0.009819	1.263106	3.841466	0.2611

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level

Table 16: AR (1) Process

Dependent Variable: DLNPPI
Method: Least Squares
Date: 04.28.09 Time: 21.01
Sample (adjusted): 1998M03 2008M11
Included observations: 129 after adjustments
Convergence achieved after 3 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002526	0.001677	1.506215	0.1345
AR(1)	0.351263	0.089423	3.928121	0.0001

R-squared	0.108335	Mean dependent var	0.002718
Adjusted R-squared	0.101314	S.D. dependent var	0.013023
S.E. of regression	0.012346	Akaike info criterion	-5.935578
Sum squared resid	0.019358	Schwarz criterion	-5.891240
Log likelihood	384.8448	F-statistic	15.43014
Durbin-Watson stat	1.979049	Prob(F-statistic)	0.000140

Inverted AR Roots	.35

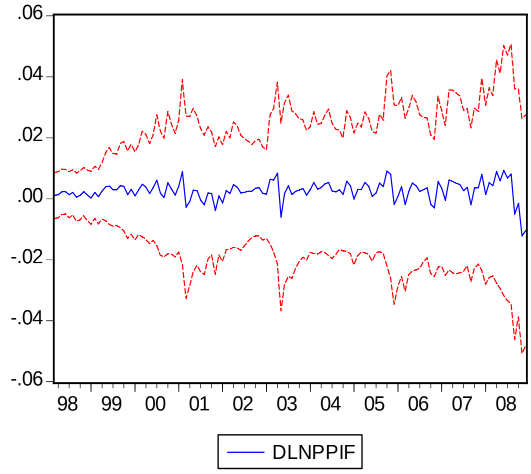
Table 17: Egarch (1, 1)

Dependent Variable: DLNPPI
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 01/12/09 Time: 00:53
Sample (adjusted): 1998M03 2008M11
Included observations: 129 after adjustments
Convergence achieved after 22 iterations
Variance backcast: ON
LOG(GARCH) = C(3) + C(4)*ABS(RESID(-1)/@SQRT(GARCH(-1))) + C(5)*RESID(-1)/@SQRT(GARCH(-1)) + C(6)*LOG(GARCH(-1))

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.002554	0.001167	2.187409	0.0287
AR(1)	0.250436	0.094340	2.654619	0.0079
	Variance Equation			
C(3)	-0.617394	0.265419	-2.326107	0.0200
C(4)	0.243832	0.106974	2.279350	0.0226
C(5)	0.145610	0.072423	2.010541	0.0444
C(6)	0.950613	0.026019	36.53515	0.0000

R-squared	0.099402	Mean dependent var	0.002718
Adjusted R-squared	0.062792	S.D. dependent var	0.013023
S.E. of regression	0.012608	Akaike info criterion	-6.247975
Sum squared resid	0.019552	Schwarz criterion	-6.114961
Log likelihood	408.9944	F-statistic	2.715175
Durbin-Watson stat	1.763873	Prob(F-statistic)	0.023076
Inverted AR Roots	.25		

Figure 2 : Static Forecast



Forecast: DLNPPIF
Actual: DLNPPI
Forecast sample: 1998M01 2008M12
Adjusted sample: 1998M03 2008M12
Included observations: 129

Root Mean Squared Error	0.012311
Mean Absolute Error	0.008531
Mean Abs. Percent Error	113.4278
Theil Inequality Coefficient	0.711105
Bias Proportion	0.000008
Variance Proportion	0.650386
Covariance Proportion	0.349606

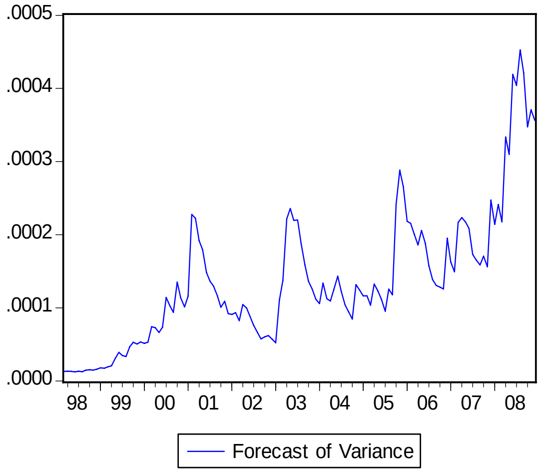
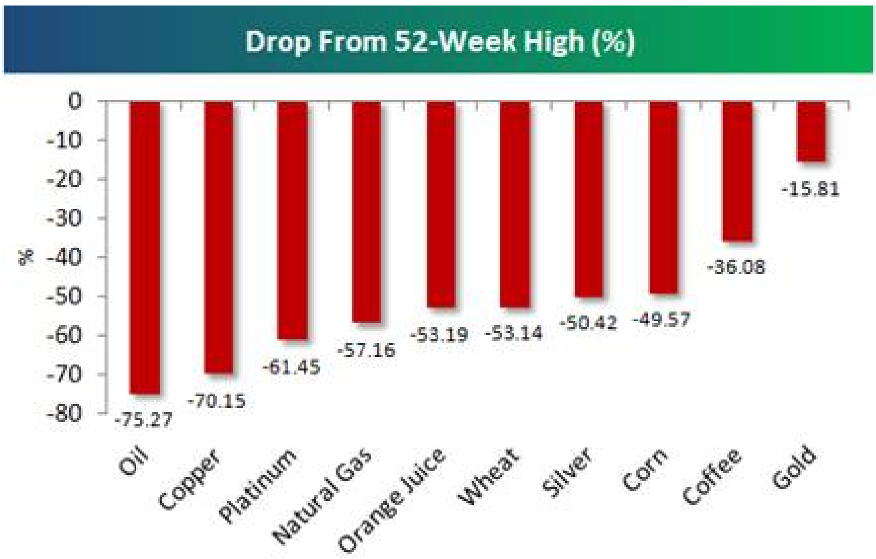


Figure 3 : Commodity Performance in 2009

Commodity Performance in 2008

Commodity	YTD % Chg	Drop From 52-Week High (%)	Start of Year to 52-Week High (%)
Oil	-62.05	-75.27	53.44
Copper	-57.94	-70.15	40.90
Platinum	-41.77	-61.45	51.06
Natural Gas	-21.60	-57.16	83.00
Orange Juice	-50.45	-53.19	5.85
Wheat	-24.84	-53.14	60.38
Silver	-29.02	-50.42	43.17
Corn	-14.05	-49.57	70.44
Coffee	-20.41	-36.08	24.52
Gold	3.87	-15.81	23.38

Source : *Gold Survey 2009*



Source : *Gold Survey 2009*