ISCTE Business School
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INVESTING IN U.S. NATURAL GAS: AN EXCHANGE-TRADED FUNDS APPROACH

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Resumo

Este estudo visa apresentar o funcionamento do mercado de gás natural nos EUA e analisar a fundo todos os seus Exchange-Traded Funds (ETFs) disponíveis como perspectiva de investimento.

Inicialmente descreve um mercado fragmentado em cinco regiões e sete actividades desde a exploração à distribuição para uso residencial, industrial ou electricidade, com vários factores a afectarem o volátil preço spot: procura, nível económico, bens substitutos, mercado externo, meteorologia, regulamentação, relatórios de armazenamento, desenvolvimentos tecnológicos, novas reservas e o menos volátil mercado de futuros.

Os resultados mostram que os ETFs de futuros são os mais voláteis mas que nos últimos dois anos maiores retornos têm alcançado, numa categoria onde só os alavancados demonstram boas capacidades de réplica. No geral evidenciaram-se proporcionais à evolução dos preços; após 2012 os ganhos voltaram a aparecer depois de um largo período de perdas. Os ETFs baseados em índices de equidade são igualmente voláteis mas com desempenho recente inferior aos anteriores pois a relação com os preços de gás natural é indirecta. No entanto apresentam boas capacidades de réplica. Os fundos baseados em parcerias limitadas (MLPs), onde se encontram os maiores ETFs, de modo geral geram, por oposição aos activos, retornos absolutos positivos. Esta é a categoria onde os fundos melhor copiam os seus índices, com volatilidades muito reduzidas, contudo recentemente apresentam uma ligeira quebra de performance.

Na parte final do estudo são apresentadas considerações sobre os temas mais relevantes: a aposta no gás de xisto e terminais de Gás Natural Liquefeito (LNG), visando a independência energética, um país exportador, e uma diminuição dos custos do gás natural internacionalmente.

Palavras-Chave: Gás Natural, Exchange-Traded Funds, Retornos, Capacidade de Réplica.

Abstract

This study presents the mechanics of the USA natural gas market and performs a deep analysis of its available Exchange-Traded Funds (ETFs) as an investment perspective.

Initially it describes a fragmented market into five regions and seven activities from exploration to distribution for residential use, industrial use or electricity generation, with many factors affecting the volatile spot prices: demand, economic wealth, substitute goods, external markets, weather, regulations, storage reports, technological developments, new reserves and finally the less volatile futures market.

Results show that futures based ETFs are the most volatile but in the last two years those who have achieved higher returns, on a category where only the leveraged funds show good tracking abilities. Generally these funds proved themselves proportional to prices' evolution; after 2012 consistent gains were registered following a large period of losses and declining prices. Equity ETFs are equally volatile but present inferior returns when compared to the previous, as the relation with prices is indirect. However they present good tracking capacities. As to Master Limited Partnerships (MLPs) based funds, where some of the largest ETFs belong, on a general basis generate, contradicting the active returns, positive absolute returns. This is the category where funds better replicate indexes presenting low volatilities, however recently we observe a slight decrease in performance.

On the final part of this study, considerations about the most relevant topics are presented: the bet on the shale gas and on Liquefied Natural Gas (LNG) terminals, aiming energetic independency, a net exporter position and a decrease of natural gas costs internationally.

Key-Words: Natural Gas, Exchange-Traded Funds, Returns, Mimicking Abilities.

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Sumário Executivo

O mercado energético de gás natural nos Estados Unidos da América é um dos maiores e mais desenvolvidos a nível mundial, dada a abundância deste recurso energético. Com a queda da Enron e a diminuição da regulação este tornou-se um dos principais mercados financeiros de bens desde 2005, sempre em constante expansão. No entanto envolve uma grande complexidade, pelo que este estudo inicialmente desenvolve todos os seus *participantes*, como interagem entre si, visando obter um quadro geral do seu funcionamento. Também há uma considerável fragmentação geográfica sendo constituído por cinco *regiões* diferentes que são apresentadas e caracterizadas separadamente. Dado que o principal enfoque deste estudo é a parte financeira e de *trading* é feita a distinção entre o mercado de preços *spot e de futuros*, uma análise de princípios e fundamentos por trás da determinação do *preço* do gás natural, bem como a descrição dos vários *instrumentos financeiros* disponíveis para investir. O primeiro ponto da tese é finalizado com a descrição da *situação actual* no mercado de gás natural nos EUA associada a toda a base teórica desenvolvida anteriormente.

O segundo ponto foca-se nos *Exchange-Traded Fund*s como perspectiva de abordar e investir neste mercado, que pela sua simplicidade e eficiência representam uma das mais populares, acessíveis e efectivas soluções actualmente. Genericamente agrupa os ETFs em baseados de *futuros, índices de equidade e parcerias limitadas*, permitindo diferentes soluções de investimento. Os fundos são descritos pelas suas características fundamentais como a *estratégia de investimento, índice alvo, data de lançamento, volume, activos, capitalização, análise premio, custos e dividendos*. Empiricamente este estudo centra-se em quatro pontos.

O primeiro consiste numa análise de performance em diferentes janelas temporais, abordando os *retornos absolutos*, *retornos em excesso* relativamente aos seus índices bem como medidas de retorno ajustadas ao risco: rácios de *Sharpe*, *Treynor*, *Information* e *Sortino*. Uma análise de *volatilidade histórica* é posteriormente conduzida para diferentes períodos e comparada com o desvio padrão. Em terceiro e de muita importância, a determinação das capacidades em replicar os índices alvo, através de indicadores como o *alfa, beta, coeficiente de determinação, tracking error, downside-risk e correlações simples de retornos*. Finalmente, todos estes pontos são analisados temporalmente através de uma técnica de *consistência temporal* que envolve subamostras que se movem ao longo do tempo.

No terceiro e último ponto deste estudo são apresentados alguns factos e tecidas considerações relativamente à exploração do *gás de xisto* e aos *terminais LNG*, temas que marcam a actualidade e futuro do mercado de gás natural e da economia dos EUA; como são relevantes e podem influenciar os pontos estudados anteriormente.

O estudo descreve todo um mercado muito fragmentado em diversas *actividades*; desde a exploração, extracção, processamento, transporte, armazenamento e distribuição, são vários os factores que afectam o trading de gás natural. *Regiões* ricas na sua produção como Texas, Costa do Golfo e a zona Centro-Este dos EUA fornecem de modo geral todo o mercado quer para *usos* residenciais, industriais ou de geração de energia, em grande crescendo recentemente. No mercado *spot* de gás natural, factores como a expansão da procura, crescimento económico, inflação de substitutos, posição importador liquida, meteorologia extrema, regulamentos exigentes e mercado de futuros inflacionado provocam subidas no *preço* do gás, por oposição a relatórios favoráveis de armazenamento, desenvolvimentos tecnológicos e novas reservas encontradas. Nos menos voláteis mercados de *futuros*, basicamente as expectativas nos anteriores factores determinam os preços e à medida que o horizonte temporal diminui a volatilidade aumenta e a correlação de trading entre duas localizações distintas diminui.

Os resultados do estudo empírico aos ETFs revelam que os baseados em *futuros* são destacadamente os mais voláteis mas que nos últimos dois anos maiores evoluções positivas e retornos têm alcançado, em especial os fundos designados UNG, UGAZ e BOIL, numa categoria onde só os alavancados demonstram replicar bem os seus indexes. Dessa forma evidenciaram uma relação proporcional à evolução dos preços; quando estes voltaram a subir após 2012 os ganhos nos futuros e respectivos ETFs voltaram a aparecer depois de um largo período de perdas e quedas nos preços.

Os ETFs baseados em *índices de equidade* demonstram que esta é uma categoria igualmente volátil com muitos fundos mistos de gás natural e petróleo. Tirando o claro vencedor GASL e o seu inverso perdedor GASX, todos os restantes fundos se têm apresentado muito semelhantes aos seus índices, dadas as suas fiéis capacidades de réplica. No entanto o desempenho geral é muito inferior aos baseados em futuros e a relação com os preços de gás natural é bastante mais indirecta, não fosse esta uma categoria baseada em activos não só de gás natural mas também de petróleo.

Já nos baseados em *MLPs*, focados em infra-estruturas de gás e petróleo encontramos alguns dos mais largos ETFs. De modo geral os retornos são sólidos e ligeiramente positivos sendo esta a categoria onde os fundos melhor seguem os seus indexes, apresentando todos volatilidades muito reduzidas. No entanto e contrariando a situação dos futuros, as performances têm vindo a diminuir dada toda a especulação relativamente ao futuro e aos investimentos no gás de xisto e terminais de LNG.

A abordagem final da tese conclui que se exploração de mais reservas de *gás de xisto* e o investimento continuarem favoráveis a produção continuará a aumentar, podendo levar a uma independência energética e abrindo fronteiras para a exportação de gás natural liquidificado através da criação de toda uma rede global de *terminais LNG* para levar o gás a mercados de maior valor. Todo o panorama de preços internacionais seria alterado com a diminuição dos custos do gás natural e a economia Norte-Americana poderia vir a encontrar aqui a sua chave para a próxima prosperidade.

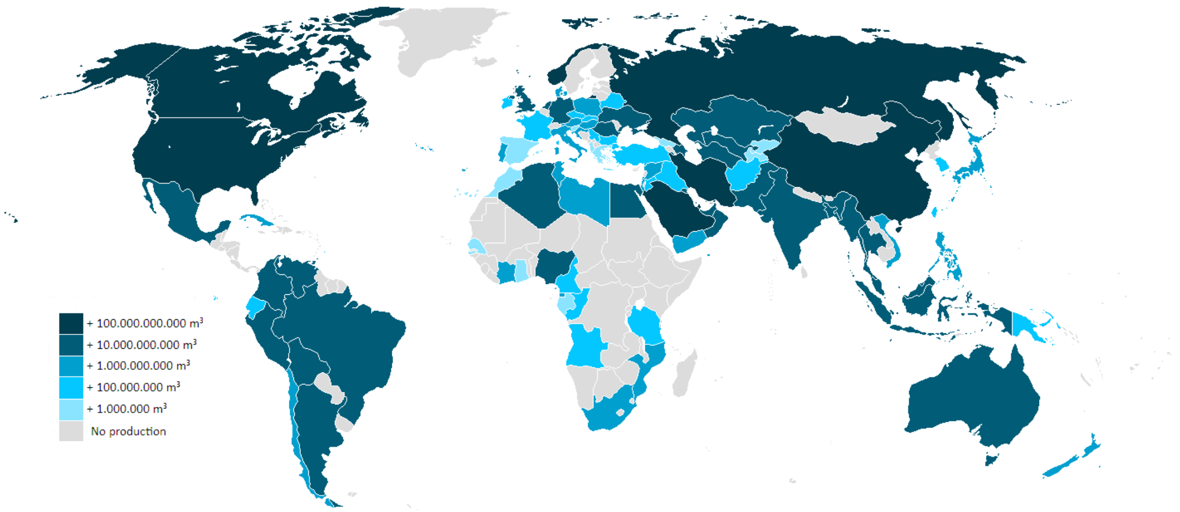
1. Introduction

The energy market, a huge specific area of commodities, started to become a worldwide major financial market around 2005 and since then trading opportunities became more wide-open and in constant expansion. It can be described as a collection of interrelated businesses from different underlying assets with the goal of delivering electricity and heating fuel to every consumer (Edwards, 2009). Businesses related to exploring, extracting, processing, transporting, and public utilities constitute this totally fragmented and complex market. It was not really new, the energy industry always was a major one but with the fall of Enron and market regulation it started see its respective financial market as a hot new area all over the globe, attracting the attention of corporations and investors as it was facing a big growth continuously.

So being the U.S. energy market one of the biggest and most developed in the world, in my thesis I focus on its most relevant commodity; Natural Gas. United States of America are now the largest producer of this energy source worldwide, surpassing the enormous Russia by the end of 2013. Annually each produces more than 650 billion m^3, far distant from the third biggest, Iran with less than 200 billion m^3, according to EIA by the end of 2012.

Figure 1

World Annual Natural Gas Production



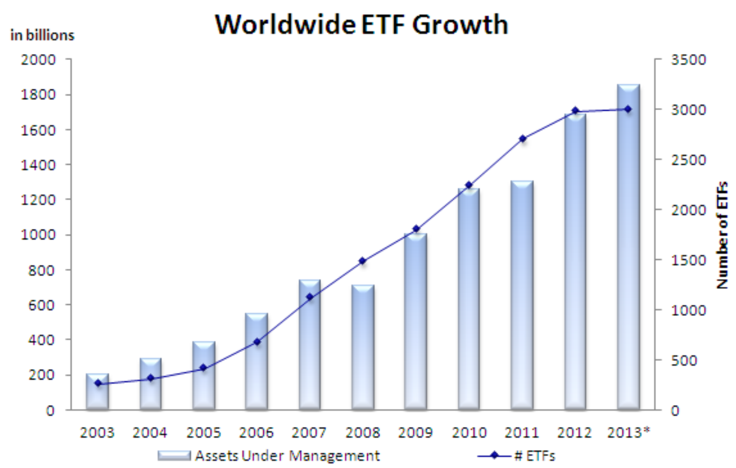
Source: CIA. 2013. The World Factbook

The second most relevant commodity is electricity which of course has a strong relation with the previous due to its use on power plants. Nowadays, the other energy markets such as oil, coal, renewables and carbon emissions markets play only a secondary role in the U.S.

So as Edwards (2009: 68) refers "*Natural gas plays a central role in the energy industry. It is cleaner than burning coal and less expensive than petroleum*." Additionally it is abundant in many areas, a low cost fuel with operational flexibility and it can be turned into liquid, Liquefied Natural Gas (LNG), which can be another solution for long distances transportation and market globalization. This energy source is defined by unique aspects such as its physical characteristics that bring storability issues, and a seasonal regular pattern of consumption due to the weather that drives its non-stop demand-supply relationship. Natural gas energy market has been always seeing its volume and importance increased last years, becoming the major one, especially in the U.S. where natural gas now is the main source of domestic energy.

On the natural gas financial market, the focus of my thesis, while hedgers, usually risk-averse producers or users of the underlying commodity, want to reduce their exposure to avoid losses, speculators, these risk-lovers and profit seekers individuals, take bets or guesses on the direction of some specific commodity using the financial tools available such as derivatives, stocks and funds. Within those I find of particular interest the nowadays widely used Exchange-Traded Funds. A negotiable unit on many stock exchanges that represents a quota of a particular already existing fund, giving any investor the possibility of accessing a pool of securities with only simple instrument that tracks its benchmark and can be traded like single share during a trading session.

Figure 2



Source: Deutsche Asset and Wealth Management. 2013

ETFs have made their successful way since its very first at 1989 [1], becoming a very popular and simple investing solution. First achieving success in the US, around 2000 this financial product was introduced in Europe and Asia. It allows the spreading of commodities to a different number of investors, from the skilled trader to the "average Joe", with only one simple fund that replicates indexes with many attractive advantages developed later. The first natural gas ETFs were incepted around 2007 such as the United States Natural Gas Fund (UNG), the most traded futures-based ETF with one of the largest market capitalizations, around 821 million U.S. dollars currently.

Zooming out to a general picture, in the US we see many local markets that only care about the spot prices of natural gas on its physical market and a whole national market concerned with future expectations for its production and price. The latter is represented mainly by the forward market, which is by far the most liquid one, the financial market. The spot market is more complicated and illiquid because of its physical constraints. To understand the natural gas financial market it is necessary to first understand the physical spot market. How all participants interact together and its complex characteristics that fundament natural gas spot prices.

So as a first step of my thesis it becomes very important to understand all those details to be able to know how the entire market works together, as well as knowing the main regions and roles that compose the US natural gas market. Then its focus will go over to the trading/marketing part of it, presenting more specific principles first and after explaining the factors that affect price. I explore the available trading tools, highlighting and explaining more exhaustively Exchange-Traded Funds, as it is the investing approach on natural gas embraced by my research. Finally and very importantly my study links all the theory presented before with the current natural gas market situation by presenting its outlook.

On the second part of my thesis I start by presenting all the US natural gas ETFs available on the market, its details and financial data to be able to perform a technical and comparative performance analysis on the empirical study chapter, the last stage of this work.

[1] Index Participation Shares (IPS), proxy for the S&P 500 index, traded on the American Stock Exchange (AMEX) and Philadelphia Stock Exchange (FSE)

The empirical study consists in four steps: a performance evaluation by absolute, active and risk-adjusted returns, an historical volatility analysis, mimicking abilities comparison and a time consistency framework of tracking abilities. Afterwards the most important issues regarding the future are linked and explored: the Shale Gas Revolution and the LNG development to a global market. These thoughts and considerations are very relevant in order to enhance the knowledge about the current situation and to forecast future outcomes.

The conclusion will sum up everything that is relevant in order to clearly understand this natural gas market investment approach, all the available ETFs and strategies given each investor's situation, doing not just a present but also a looking forward perspective.

2. Literature Review

The U.S. natural gas market is a highly complex and fragmented network with many factors affecting its ultimate indicator; the price of natural gas. Not only many researchers but also energy market professionals elaborate studies and analyses on the natural gas market mechanics to provide a better understanding of its functioning and to educate potential investors. At the same time adopting an Exchange-Traded Funds investment perspective allows enhancing the knowledge about this useful and highly accepted financial product that is studied by researchers since the beginning of the last decade. The link between these two topics makes perfect sense as an approach to understand and invest in natural gas.

Edwards (2009) on his guide about energy investing divides and describes all the natural gas market into seven activities and five regions, explaining how they interact to form the mechanisms that influence natural gas prices and trading. To support this knowledge he previously provides an overview on the energy markets in general describing the different energy sources, statistical and financial tools as well as risk management notions and concepts about trading markets. On this part he develops analyses on the spot and forward markets, trades and positions, OTC and exchanges, financial contracts, time value of money and unique features of the natural gas market. Also Bros (2012) provides similar knowledge but more on an academic basis, not so for investors as Edwards (2009) focuses. Bros (2012) analysis the natural gas market in a more global way, describing basically each previous activity of the market with geographical approaches. He gives backgrounds not only on U.S but also on other main natural gas producers such as Russia, China, Europe and Mideast. I found his studies specifically useful related to LNG and natural gas trades between countries as lots of analyses are provided. Bros (2012) also develops facts and considerations about future worldwide supply and demand.

On the same perspective Levi (2013) expands the debate on investing more in fossil-fuel supplies and its consequences to the U.S economy. More specifically the investment in natural gas that is reducing carbon emissions, creating more jobs and leading towards a huge supply, a strong view on this analysis that opposes different energy sources. The official organization U.S. EIA (2013) explains the factors affecting prices as being the variations in the amount of supply, the imported/exported volume, the stored amount of gas, the level of economic growth, the summer and winter weather conditions and oil prices. Another EIA (2013) report on energy, the annual outlook, provides projections and analyses of natural gas market trends and sectors giving an overview of the current market situation. On EIA (2014) short-term energy outlook is provided the latest natural gas market developments as well as all the historical evolution of prices, production, consumption and storage variables. It is a very complete and indispensable guide that approaches everything to know about nowadays' situation.

Johnston (2011) provides a practical view on investing on natural gas through its properties and uses, more price drivers and the available financial tools to bet on natural gas. He defines those as being futures contracts, equities on natural gas companies, ETFs and ETNs. Similarly Cummans (2011) elaborates a guide on the same financial tools adding basically the Master-Limited Partnerships equities, additionally giving several reference products for each category.

Focusing on the ETFs investment approach, Zacks (2012) presents the most popular and relevant available Exchange-Traded Funds such as UNG, UNL, FCG, GAZ, NAGS, GASX, GASL, UGAZ, DGAZ and BOIL on its comprehensive guide to natural gas ETFs, building a good starting point list to study this category.

Being a target of many academic studies, this recent type of funds is developed for example by Gallagher (2005) that examines the performance and trading characteristics of ETFs. He investigates the ability of index oriented ETFs to track equity benchmarks and concludes that off-market managed funds behave poorly when compared to index-oriented ETFs, by analyzing the tracking error and volatilities on classical Australian funds as well as North American. Additionally Gastineau (2001) covers the Exchange Traded Funds advantages, clarifies the sector adequacy to have them, the low expense ratios and short significant capital gains distribution, giving us a better knowledge on ETFs characteristics and investing. Also Gastineau (2004) on another paper describes the association between capital gains and losses with fund performance and tracking error. He analyzes ETFs' creating and redemption process developing why index ETFs have been underperforming and provides a better long term solution. For sure another useful study to understand these funds main drivers and logics. Svetina (2008) and Wahal (2008) conclude on a huge study containing a large heterogeneous population and different types of indexes that on average ETFs underperform their benchmark indexes and show a significant tracking error and only a small portion give similar results to index funds however without statistical distinguishable returns from the previous.

Referring to the last part of my study EIA (2011) reviews the U.S. Shale Gas and Oil Plays on an article that clarifies the developments, investment and production on the main and most relevant studied plays such Marcellus, Haynesville-Bossier, Eagle Ford, Barnett, Fayetteville, Woodford and Bakken. Sieminski (2014) concludes about shale gas impacts on U.S total production and oil prices showing positive outcomes for North America in comparison to other big players such as China and OPEC countries. EIA (2013) issued an International Energy Outlook with useful projections and macro-economic issues affecting the global natural gas consumption and demand that is showed to keep growing and creating balances between more countries. Medlock (2012) discusses the impacts of LNG exports in an international context and the already being seen consequences of shale gas that has expanded production, decreased the oil price and raised possibilities of exports. Medlock (2012) forecasts a more elastic global natural gas supply curve and decreasing effects on both U.S. national and international natural gas prices with the expansion of a more elastic domestic supply.

3. The Natural Gas Market

3.1 Activities and Participants

The natural gas market is quite complex with lots of participants interacting and operating together, on which usually one company focus in one area only or two at most. It is important to have a clear view of the entire picture and its respective details, understand and follow the production steps that fundament natural gas pricing, supply and demand.

- **Exploration**

Exploration is the base and first activity of this market. Natural gas, a fossil gasified fuel that results from a combination of gases [2] extracted from underground wells, is usually found in oil fields, coal beds, underground formations from decaying organic material's gases that did not disperse. Natural Gas is usually considered dry when mostly composed by pure methane.

Basically, exploration companies look for a permeable layer of rock, underneath an impermeable one, where natural gas is stored and trapped, studying these rocks physical characteristics because it directly impacts on the gas extraction speed. To be economically viable, those permeable rocky formations where natural gas exists must contain enough storage through its permeability, porosity or holes. This constitutes the space inside of the rock that these companies always look forward to have an economically significant amount of gas on the area, with as much connected pores as possible. Texas and Gulf Coast Region is the most important natural gas producing region in North America, with the most optimal sites for exploring it.

- **Extraction**

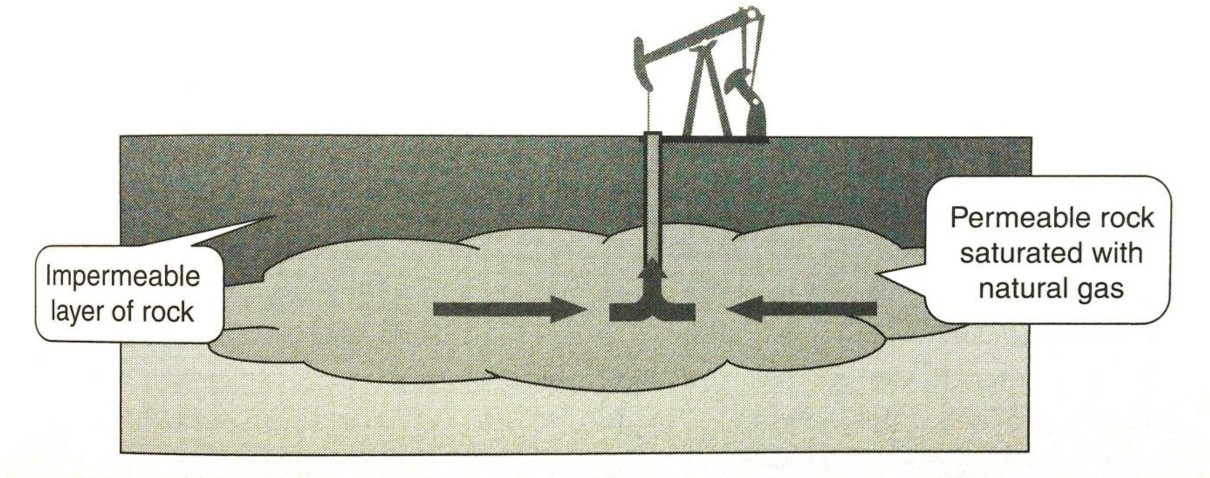
Extraction is the next step, companies build huge wells to drill through the impermeable rock layer to the permeable one beneath, where the gas is trapped, bringing it to the surface.

[2] Primarily methane and other hydrocarbons such as ethane, propane and butane.

They manage air pressures of the natural reservoirs with the wells vacuum to attract the gas to the upwards. Also, injecting water into the well can speed up the process as it increases the pressure bellow with the same logic as before (Edwards, 2009).

Figure 3

Extraction Process



Source: Edwards, D. W. 2009. Energy Trading and Investing

- **Processing**

The raw natural gas needs to be processed in refineries to be able to meet a consistent quality standard and the standard energy per unit volume because basically the only component that matters within the gas is methane. The several other components are filtered and dropped by raising its temperature to a certain level where only methane will resist and be stored.

- **Transportation**

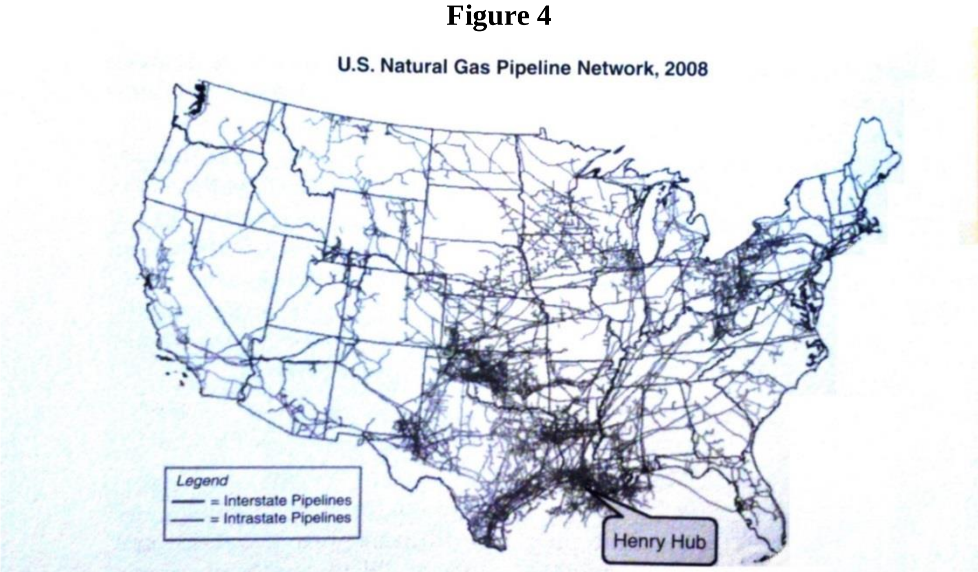
As soon as the gas meets its standards, it is ready to be transported. As a low density product it is transported by pipelines that provide a continuous feed of gas and operate at moderate pressures. This network is strongly regulated [3] and formed first by wells that are connected to refineries by shorter pipelines and then from refineries to consuming regions by transcontinental/interstate huge pipelines.

[3] By FERC, Federal Energy Regulatory Commission

These last ones usually are designed to make some profit, standing somewhere between a public utility and for profit companies. Transportation companies usually provide services that range from guaranteed delivery, more expensive, to various levels of non-granted delivery with different charged rates. Along with distribution companies these delivery services are coordinated and customers can choose which option fits best for their use.

Pipelines are often connected at hubs, where two or more connect, and citygates, where interstate pipelines connect to local distribution. This hubs and citygates are an essential part in the market because it is where most of the trading occurs, being the most important the Henry Hub in the Gulf Coast, halfway between Houston and New Orleans, where 13 main pipelines connect. Henry Hub spot and forward price play a major role on the energy market as it serves as the benchmark for the entire North American Natural Gas market and as the delivery location of the most popular and traded NYMEX natural gas futures contracts.[4]

Figure 4



Source: Edwards, D. W. 2009. Energy Trading and Investing

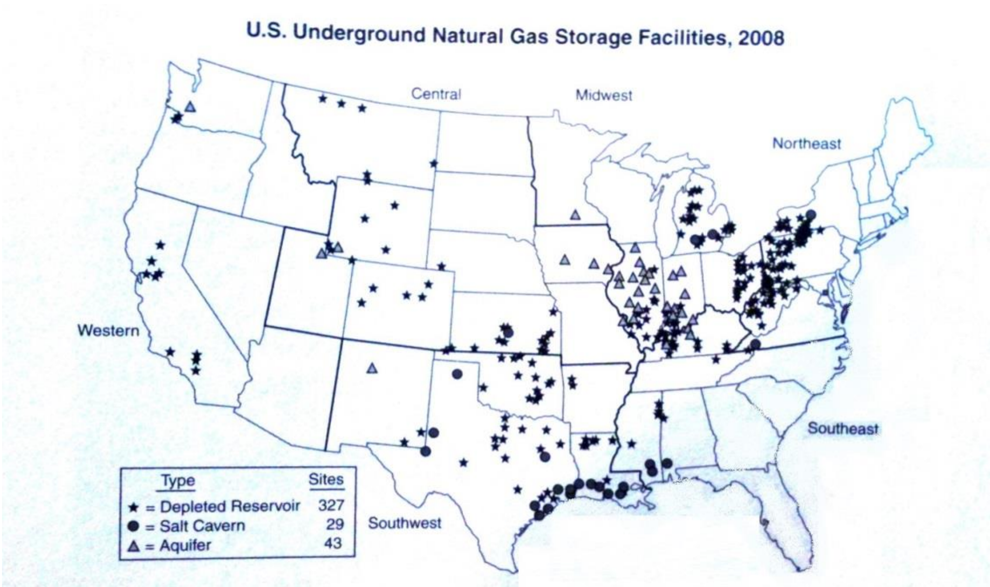
Apart from pipeline transportation, Liquefied Natural Gas also constitutes a solution for transportation. LNG facilities, by cooling natural gas until -260ºF and storing it in tanker ships containers, can be the way to go in terms of overseas transportation that in the future can replace the isolated regional markets by a global one, according to Bros (2012). I will present a LNG discussion when we embrace the future perspective in the last section of the thesis.

[4] CME NG Henry Hub Natural Gas Futures

- **Storage**

Along with transportation, storage is the other half of that story. In the U.S. there are around 400 storage reservoirs, usually close to refineries, hubs, major pipelines or to where ultimately gas is consumed. As it is not that economically viable to store natural gas after being explored and extracted, it has to be drilled for close distance consumption in some cases or transported by long pipelines. Companies are obligated to provide a constant supply for immediate consumption in other areas at a higher cost and dependency (Edwards, 2009). This happens because pipelines cannot stop operating, so gas has to be continuously added and removed in order to maintain the targeted pressure. Stopping this process would take several days to resume full fill and capacity of the pipe. Storing gas requires a huge space so these facilities are large underground specific natural reservoirs, some of them were former extraction points technically called depleted gas reservoirs. Others are salt caverns and aquifers, large enough to be cost effective the use of equipment to pump in and out gas of the facility.

Figure 5



Source: Edwards, D. W. 2009. Energy Trading and Investing

Also natural gas can be stored after turned liquid at very low temperatures as mentioned before, occupying a lot less space, and providing an alternative for storing that can get more effective if LNG technology becomes more efficient and economical too in the future. Storage facilities are the best way to deal with the non-constant consumer demand that implies a non-constant supply. So, storability is needed at both pipeline ends; in the beginning to prevent refineries interruption and at the end to adjust to consumer demand.

- **Distribution**

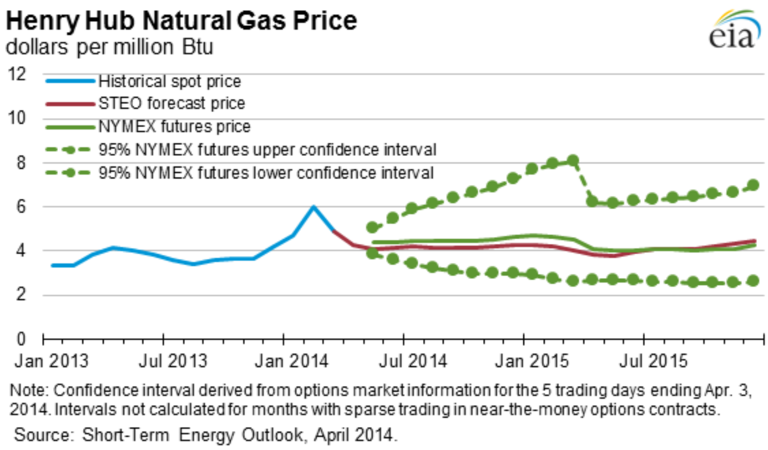
After these processes, distribution companies operate locally, delivering the transported and stored natural gas to consumers through a local distribution network of small pipelines within each region. They maintain the connection to every home and business regardless of the economic profitability, which sometimes is threatened because this local network is very expensive to maintain. So local delivery charges account for that, usually summing to the citygate price the local delivery cost. Also, as mentioned before, delivery services can vary depending on the transportation contract; firm service, very reliable that guarantees availability except when prevented by an act of greater force at a more expensive cost, or interruptible service which offers the best efforts to deliver it but there is always the possibility of being interrupted for any “minor” reason.

- **Trading and Marketing**

After Natural Gas being available, it becomes an energy commodity like many others, a target of speculators and hedgers that participate on this huge market by trading and making market operations. Traders can operate on the spot market where they buy gas for immediate delivery by local distribution networks dealing with the supply and demand at that moment in a given region (Bros, 2012). This market is more volatile than the forward market where the deliveries occur at some point in the future, due to the time to adjust of gas production, transportation, delivery and storage, all factors that can be arranged ahead of time on this case. So on this scenario, prices are determined mainly by supply and demand in the future, using an expected average relationship that take into account many factors to be explained later.

On the other hand, spot prices are all over the place, they are based on short term supply and demand and so the predictability is inferior, resulting on a higher volatility. Also in the short term there is no relationship on prices between two locations because of the difficulty of transporting it on short notice. Comparing to other commodities, this spot/forward relationship is less reliable and more complicated because of the constraints in transportation, storage and mandatory continuous supply.

Figure 6



Also natural gas has no intrinsic value by itself so there are no longer than one year buy and hold strategies, using the available storage rooms. However, physical trades that involve the actual delivery of the commodity, usually common on spot markets, are more complex and at the same time financially more rewarding than financial trades according to the research by Edwards (2009). These last ones are associated with the forward market, working on a transfer of cash basis.

Knowing all this, when we compare the spot market and the forwards market the conclusion is that they are not closely linked because it is not much viable to buy natural gas at one point in time, store it and deliver it later.

- **Users**

Finally, users are the ultimate participant of this big market. Industrial users are the major ones, followed by residential users and electricity generation power plants. Industrial entities prefer natural gas because there is no waste of fuel by turning off the equipment. Also the ignition/shutdown is faster than using coal for example, among other small advantages. Residential use is also very common; about half of North American houses use it for heating and other common housing appliances. The third big use is to generate electricity on power plants, with less greenhouse gas emissions than coal or oil based plants.

3.2 Regions

United States natural gas market is divided into five very distinct regions. Each has its unique characteristics and role as Edwards (2009) describes.

Figure 7

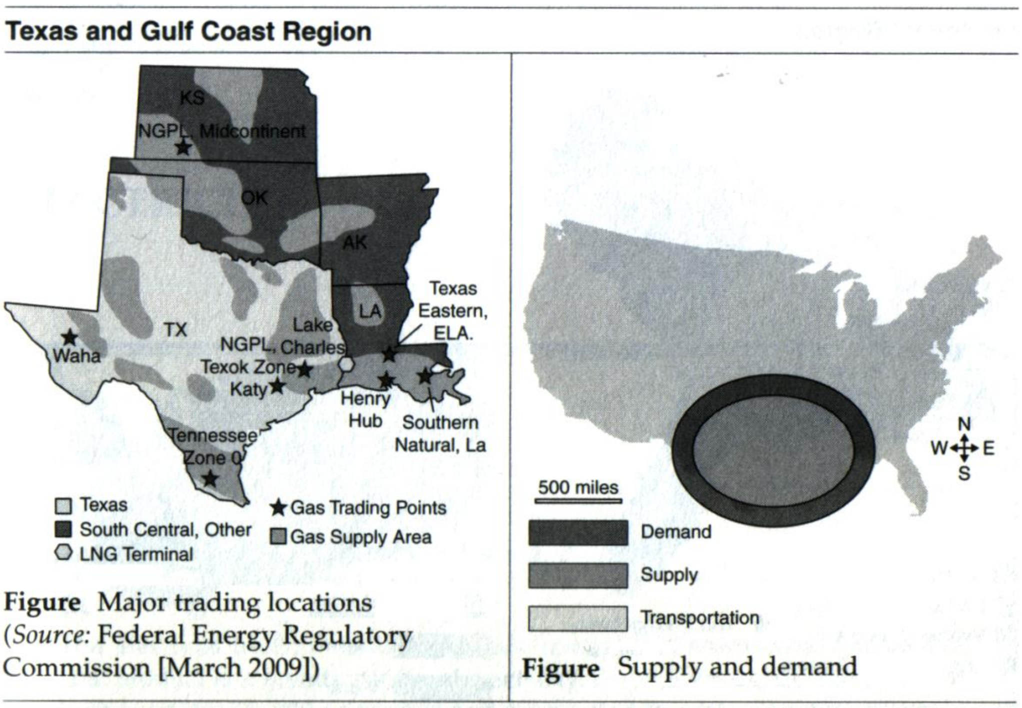


Figure Major trading locations (*Source:* Federal Energy Regulatory Commission [March 2009])

Figure Supply and demand

Source: Edwards, D. W. 2009. Energy Trading and Investing

The Texas and the Gulf Coast Region is composed by *Texas, Oklahoma, Kansas, Arkansas, Louisiana,* and characterized as:

- ✓ Net exporter of natural gas mostly to the East Coast and to the industry intensive Midwest. The Texas and the Gulf region is the most important producing region in the US.
- ✓ Heavily dependent on natural gas for electricity generation mainly.
- ✓ Abundant in local supplies.
- ✓ Limited seasonal demand on usually moderate winters.
- ✓ Considerable amount of storage.
- ✓ Region basis prices highly correlated to NYMEX futures prices on which Henry Hub belongs.

Figure 8

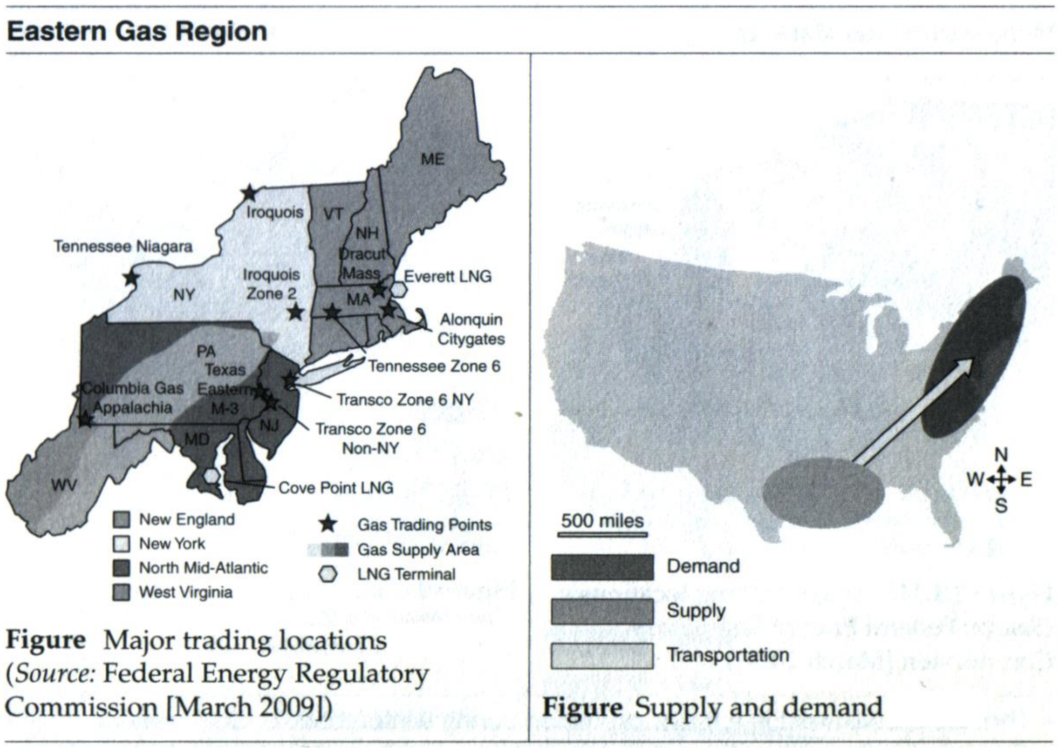


Figure Major trading locations (*Source:* Federal Energy Regulatory Commission [March 2009])

Figure Supply and demand

Source: Edwards, D. W. 2009. Energy Trading and Investing

The Eastern Gas Region is composed by *West Virginia*, *Pennsylvania*, *New York*, *Vermont*, *New Hampshire*, *Maine*, *Massachusetts*, *Rhode Island*, *Connecticut*, *New Jersey*, *Delaware*, *Maryland*, and characterized as:

- ✓ Heavy importer of natural gas from the Gulf region.
- ✓ Intensive use of natural gas for both residential heating and electrical generation having a year round demand.
- ✓ There is a limited amount of storage.
- ✓ Strong seasonal demand on winters for both uses, resulting on the often highest basis prices in the US.
- ✓ LNG terminals building region to import gas from other regions and provide more storage.
- ✓ Basis prices highly correlated with NYMEX futures settled at Henry Hub.

Figure 9

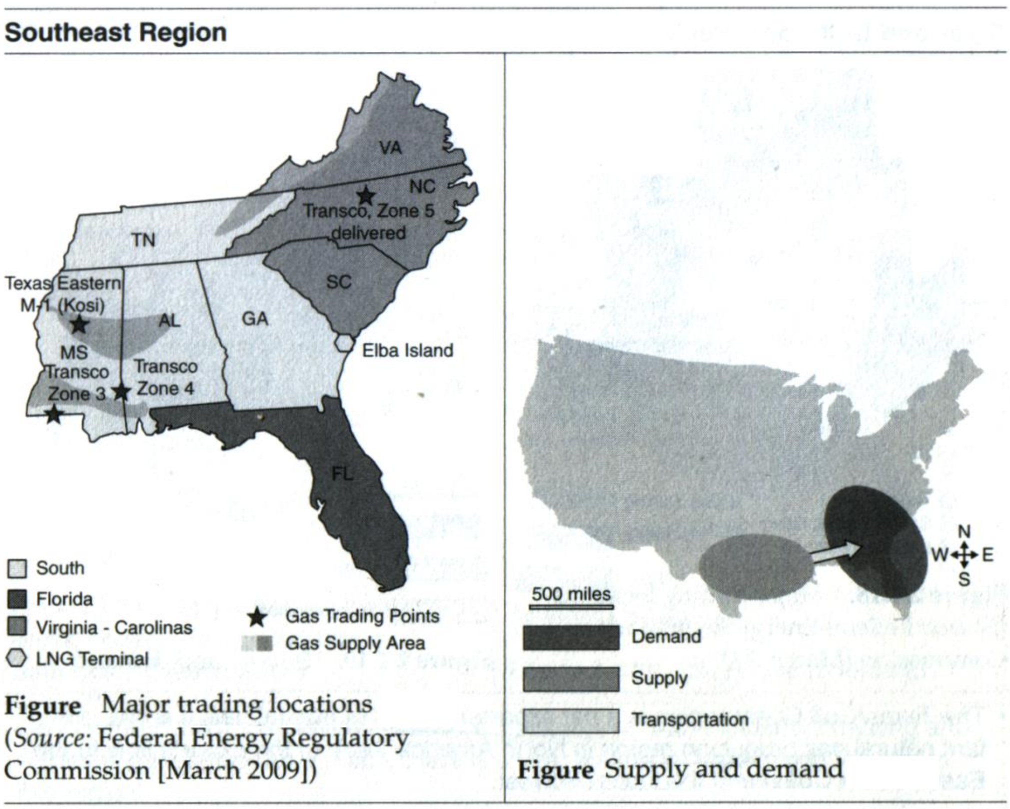


Figure Major trading locations (*Source:* Federal Energy Regulatory Commission [March 2009])

Figure Supply and demand

Source: Edwards, D. W. 2009. Energy Trading and Investing

The Southeast Region is composed by *Tennessee, Virginia, North Carolina, South Carolina, Florida*, *Georgia*, *Alabama*, *Mississippi*, and is characterized as:

- ✓ Natural gas primarily used to generate electricity.
- ✓ Strong seasonal demand for electricity due air conditioning use on hot summers but limited heating use on the warm winters.
- ✓ Almost no storage capacity.
- ✓ LNG terminals being constructed to increase supply and storage.

Figure 10

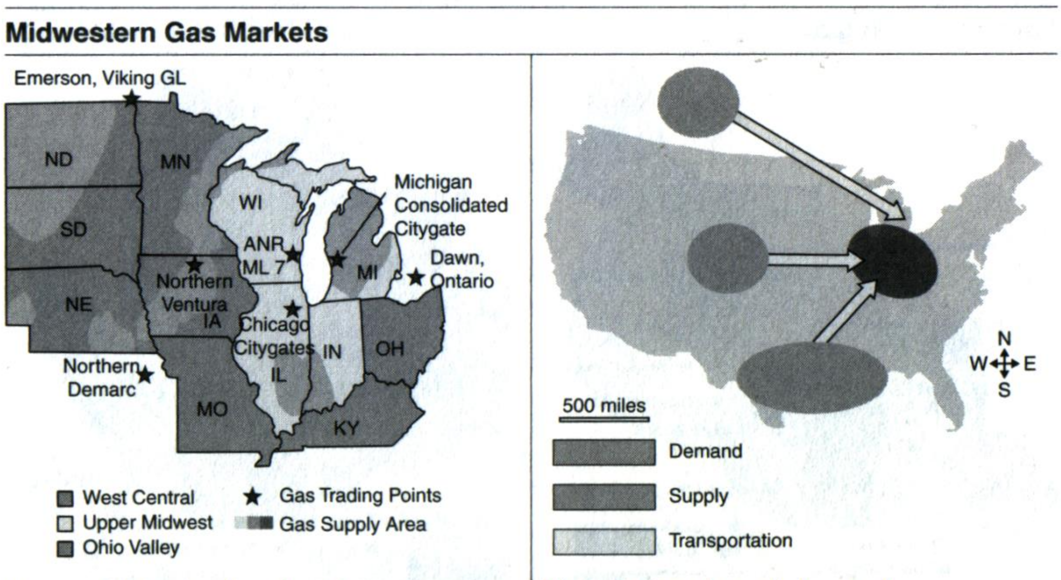


Figure Major trading locations (*Source:* Federal Energy Regulatory Commission [March 2009])

Figure Supply and demand

Source: Edwards, D. W. 2009. Energy Trading and Investing

The Midwestern Gas Market is composed by *North Dakota, South Dakota, Nebraska, Missouri, Kentucky, Ohio, Michigan, Indiana, Illinois, Iowa, Wisconsin, Minnesota*, and is characterized as:

- ✓ Large pipelines receive natural gas in bulk mainly from the major supply basins in North America, more specifically Canada and Rocky Mountains.
- ✓ Major consuming region during cold winter months for providing residential heating mainly, contrasting with comparatively little demand in summer.
- ✓ Natural gas not the primary fuel for power, coal power plants are more abundant.
- ✓ Many storage facilities and extensive local distribution network obligated to always fulfill first the residential demand during winter's very cold months.
- ✓ Basis prices only somewhat correlated with NYMEX futures because it only imports some percentage of gas from the Gulf region due to other most convenient.

Figure 11

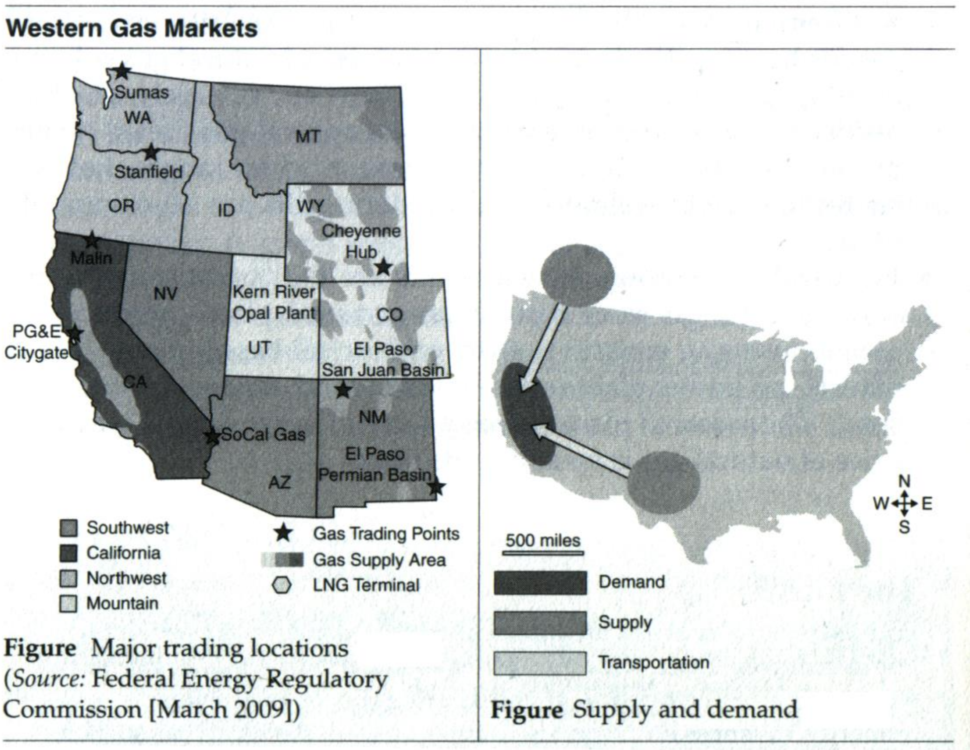


Figure Major trading locations (*Source:* Federal Energy Regulatory Commission [March 2009])

Figure Supply and demand

Source: Edwards, D. W. 2009. Energy Trading and Investing

The Western Gas Market is composed by *California, Arizona, New Mexico, Colorado, Wyoming, Montana, Washington, Oregon, Idaho, Nevada, Utah* and is characterized as:

- ✓ Substantial amount produced at the eastern edge of the Rocky Mountains; however it rather flows to Midwest.
- ✓ Most regions have sparse population but heavy populated California is the biggest user of natural gas. So most trading occurs there, importing it from Canada and the Desert Southwest.
- ✓ Heavily dependent on natural gas for electrical generation.
- ✓ High demand in very hot summers due to air conditioning intensive use and limited demand in the moderate winters.
- ✓ Natural gas demand peaks price also depends on the major competing source, hydroelectric power, boosted by large precipitations and snowmelts, decreasing it.
- ✓ Very limited storage capacity.
- ✓ Western basis prices not highly correlated with NYMEX futures since the region does not import directly from the Gulf region.

3.3 Trading and Marketing

3.3.1 Principles

- **Prices**

Along the US, we can distinguish *basis prices*, the natural gas prices at some location quoted in relation to Henry Hub price, basically a spread form, which gets similar to transportation price to get gas from Henry Hub to that specific place. The *index price* refers to the Henry Hub price as primary index for natural gas prices all over the United States. And finally the *all-in price*, composed by the index price plus the basis price. Basically it is the natural gas price at some specific location.

- **Positions**

Generally on trading strategies, traders adopt *actual positions*, exposing traders to the actual [5] outright price at some location, or *basis positions*, exposing them to the basis price, the spread between two locations. Basis trading is very common as it combines futures traded at Henry Hub with a basis swap that changes Henry Hub exposure to some other location.

- **Strategies**

Summing up, the most common strategies (Edwards, 2009) are to bet on the direction of the entire natural gas market, involving a higher volatility, or to trade on spreads, eliminating the exposure of the entire market moving up or down and making the trader to benefit from the price difference between two locations, called the *location spreads*. These are influenced by local demands, supplies, pipelines and storages. Another type of spread trading are *heat rates*, on which one speculates on the relationship between natural gas and electricity that usually mirrors the previous because power plants can turn it to electricity.

[5] The physical commodity delivered at the completion of the contract

So that on this case the trader might profit from the volatility between both because they usually move together but not all the times. *Time spread* strategies are also common to speculate on periods of high and low demand, for example, the result of seasonal effect. Similarly we find *swing trades* on which traders store natural gas for short periods and trade on short term demand/supply required differently within various periods of the week. It is similar to time spread strategies but for much shorter periods.

- **Spot Market**

On the *spot market*, more supply is prevented from coming in and demand from leaving. But when long time frames are considered, the assumption that natural gas prices are a function of supply and demand directly can be misleading. On this particular case, future supply depends on natural gas prices, the higher they are, the more economical it gets to explore and extract more gas from less accessible reserves. So the long run supply will directly depend on prices and demand rather than otherwise according to Bros (2012). And the prediction about future prices is mostly a function of expected demand of natural gas.

The national basis single largest factor affecting natural gas demand and spot market is weather. There is a linear relationship between temperature and natural gas consumption. It clearly increases on a seasonal basis, on winter for heating and summer for air conditioning cooling, decreasing on fall and spring due to more moderate weather conditions.

- **Forward Market**

By the other side, *forward prices* follow seasonal future expectations of supply and demand. There is a clear regular seasonal trend if we observe the curve, usually these expectations are the same every year so they tend to mirror consumers demand on a very regular pattern, decreasing the volatility in comparison to spot prices. From this we can easily imply that the more time to expiration, the less daily volatility we will face. Prices become less certain closer to the delivery unlike most markets because of short term disruptions on natural gas supplies that have a big effect on the spot price. Also, large movements on the spot price do not affect largely futures price due to its tendency to revert to prices based on typical consumer demand and expected supplies. We also verify more correlation between two different locations on the forward market due to the time to arrange transportation and storability.

3.3.2 Factors Affecting Price

- **Supply side:**

- As explained before, the first most basic factor affecting the amount of Natural Gas being produced is the *relationship with demand*. More demand leads to higher prices that increase the economic profitability for existing companies and attract new ones to work on the various activities of the market, building more infrastructures, exploring and producing more Natural Gas. After increasing first, for some period of time the price starts to lower due to this increase in supply, until it gets less economically viable again. This is direct and plain economics.

- *Storage reports* represent the inventory levels of natural gas nationwide. The Energy Information Administration (EIA) releases that report every Thursday at 10:30 ET that details how much gas is stored in total and by regions at that moment. On short term, storage availability serves to deal with sudden shifts in supply and demand, meeting its peaks and avoiding prices going upwards due to possible shortage on supply caused by various explained reasons. But most importantly prices react to this announcement in comparison to analysts' former expectations. If they are greater, price tends to go down, revealing the increased availability. But on the other side, on Thursdays, due to the announcement, natural gas trading activity increases. This fact that can drive prices upwards a little bit. As we can observe, storage reports play an important role on the market.

- *Imports and exports* directly influence the natural gas supply. Nowadays U.S. is a net importer. Pipeline and LNG correspond to 6% of total consumption. The big majority, more than 99% from Canada while the rest from Mexico. Imports usually occur at a higher price. Exporting Natural Gas can have a big impact in the future through Liquefied Natural Gas technology which is associated with a possible future global market. There has been an active bet on trading LNG in the Pacific region until now. But with the current LNG regasification plants in North America and Europe, the consumer base for LNG is seeing another high value markets. This would have big effects on the general level of prices. While abroad they would possibly go down, internally in the US there could be a pressure for price upward movements as it is going to be analyzed after.

- *Severe weather events* like hurricanes, tornados, among others, can affect directly the regional supply if they lead to disruptions that would cause shortages of supply and non-meet demand that obviously would increase much gas prices. As a good example we have the hurricanes along the Gulf Coast in the summer of 2005 that lead to the shutdown of about 4% of total US production during the next year, because infrastructures where affected.

- *Technological developments* are an important part of future supply as they strive to a more efficient and cost effective drilling process. This would turn more economical all the natural gas businesses, attracting more companies and infrastructures, making the commodity more accessible and widespread used, resulting on a supply increase and prices decrease.

- Finding out *new reserves* also can have a big impact on the present and future price. And what better time than now to apply this price-driving factor to the so discussed "Shale Gas Revolution". Recent technological developments have proved that shale formations can be very rich and viable in Natural Gas extraction. It is called the Shale Gas because of its origin on these characteristic rocky layers. Despite generating a big controversy, dividing many opinions, it had an increasing effect on general gas reserves that lead to a decrease of prices and similar future expectations. This is another hot topic that will be explored in the end discussion regarding the future.

- *Regulatory environment* plays a minor but relevant role within all this, especially when we talk about hydraulic fracturing to drill and access gas in shale formations. This process can cause bad environmental issues that are now being debated all over and can influence the future of this "new" source, affecting indirectly natural gas prices.

- The *Futures Market* is intensively used by investors that achieve exposure through futures contracts. That fact shapes out the slope of the futures curve as having a direct impact on performance. For example if the forward market is in contango [6] it can cause a lag for future-based products in relation to the hypothetical spot return.

- **Demand side:**

- As stated before, *weather* is the national basis single largest factor affecting demand side. During winter cold months, residential and commercial end users use natural gas for heating, causing demand to increase directly so prices move up. Sometimes severe winters, like the last one that started on December 2013 when most of North America got covered by snow and historically low temperatures, evidence the urged demand that intensifies the effects on prices. Sometimes because supply simply cannot adjust quickly enough in all regions, other times because as the transportation system is already at full capacity, storage reserves gathered during lower demand periods have to be used. Summers have a very similar effect because air conditioning cooling uses electricity that currently is 30% generated using natural gas as a fuel source. Fall and spring usually are more stable and present lower prices. Forward markets reflect all this as shown below; there is clearly a regular seasonal trend on future prices as well as historically spot prices.

- According to EIA (2013: Energy Explained) "*The strength of the economy is a major factor influencing natural gas markets.*" Why? During positive periods of growth as we all know, the demand for goods and services from the commercial and industrial sectors increases. As a consequence, natural gas price makes the same movement because especially when we talk about more industrial activity that is widely based on this energy source to operate and deliver its final products to the economy. As it requires more power usage, general demand expands and prices go up. Logically, declining economic growth has the exactly opposite effect.

- Mainly industrial and electricity generation consumers can switch between *other available energy sources* to do their activities.

[6] Scenario when futures price of a commodity exceeds the expected spot price

Natural gas, oil, coal, renewables, all have different prices and if the trade-off between price and usage gets better for any of those sources there can be a switch, despite most being less clean and carrying environmental issues. So there is of course a relationship between all these sources. If any other alternative decreases substantially its price, the shift results in less natural gas consumption, so prices decrease until it becomes again more attractive, causing shifts for natural gas again, increasing the demand and prices consequently.

Table 1

Price Affecting Factors

Supply Side	Price	Demand Side	Price
Expanded Consumer's Demand	Up	Seasonal Weather	Up
Favorable Storage Reports	Down	Economic Growth	Up
Increased Net Imports	Up	Cheaper Alternative Sources	Up
Severe Weather Events	Up		
Technological Developments	Down		
New Reserves found	Down		
More Regulated Environment	Up		
Contangoed Futures Market	Up		

3.3.3 Trading Instruments

Natural gas is a very popular and attractive commodity among investors due to its high volatility as well as consistent growth predictions, exhibiting big daily swings with high and liquid volumes. This can mean relevant losses but if "played right", short term wins can be considerable (Johnston, 2011). There are plenty of instruments to trade on this energy commodity that suit all different kinds of investors. From "buy and hold" strategies that present a safe structure to direct invest in the commodity with total exposure.

- **Futures**

Most commonly in the US, Natural Gas is traded using super standardized futures contracts that are priced at Henry Hub location in Louisiana.

They can be found on NYMEX at the CME group [7] and the most important in the forward market because they serve as the benchmark for all other instruments. *Henry Hub Natural Gas Futures* involve no counterpart risk, quick transactions and high liquidity at low transaction costs. The underlying commodity is Natural Gas delivered at Henry Hub interconnection in Louisiana. Curiously most electricity prices are based on this contract, another fact that also shows its influence. One contract represents 10,000 million British thermal units.

Futures contracts were the original method to obtain direct exposure to commodities and involve a quite complex futures account that requires more than an average investor to manage. Cummans (2011: 25 Ways to Invest in Natural Gas) states: "*For those who fully understand the nuances of these contracts, futures can be one of the most powerful trading tools for an investor, as they offer exposure that, in some cases, can be found nowhere else in the market.*" Another considerably used futures contracts are the *Henry Hub Natural Gas Look-Alike Last Day Financial Futures* that settle only on the last trading day for each contract month and the *E-mini Natural Gas Futures* that represent a smaller quantity of the underlying asset, just 2,500 mmBtu, allowing small investors to also participate on this market (Cummans, 2011).

- **Options**

Options on natural gas are also available. Called *Henry Hub Natural Gas Calls/Puts*, these American style options are traded at CME and represent an option to assume a short or long position in the underlying Henry Hub natural gas futures traded on that exchange. The settlement type is the exercise into Futures accordingly to NYMEX position limits, rules and regulations. Comparing to plain Henry Hub futures, these options offer additional leverage since the premium paid is usually lower than the margin requirement needed to open a position in the underlying natural gas futures. Also they limit potential losses because of its "right instead of obligation" characteristic. The loss can only be the premium paid on the purchase. Flexibility is also another characteristic of financial options because we can combine various strategies to reach a specific risk level. Usually traders use options alone or combined with plain futures as its relation is very close.

[7] New York Mercantile Exchange belongs to the Chicago Mercantile Exchange Group derivatives market

- **Stocks**

On the other hand as Cummans (2011: 25 Ways to Invest in Natural Gas) refers: "*Investing the equity side of the equation isn't a pure play on natural gas*". But it can still offer interesting and unique investment opportunities. These equities are related to companies that explore, drill, refine and transport natural gas, commonly offering strong dividend options and high liquidity. The principles are similar to those before. The higher the price of the resource natural gas, the higher tend profits to be because profitability depends on the market price of the product sold, especially for those companies with a more significant fixed costs structure. Some examples of natural gas company stocks are *Exxon Mobil, Devon Energy Corporation, Chesapeake Energy, Cimarex Energy, Cabot Oil and Gas Corporation, Range Resources Corporation, EOG Resources, SandRidge Energy Inc., Suncor Energy Inc., SM Energy Co, Talisman Energy Inc.*, among some others that can be found on this immense energy market.

Another type of equity investing is *Master Limited Partnerships*, partnerships that focus on oil and natural gas pipelines as they build new and upkeep the current infrastructure that supports the entire US energy usage. MLPs funds usually are associated with high and attractive dividend yields, ideal for value investors. Some of these high-yielders are *Kinder Morgan Energy Partners LP, Inergy LP, Boardwalk Pipeline Partners LP, Enbridge Energy Partners LP, Energy Transfer Partners LP, Natural Resources Partners LP and Buckeye Partners LP.*

- **ETFs**

Exchange-Traded Funds are special open-ended funds that are traded on a stock market like shares of individual companies but represent shares of entire portfolios that aim to track the performance of a specific natural gas index on this case. Due to its simplicity they constitute a great alternative for plain-vanilla futures contracts or other products, allowing less expert investors to still enter the trading market and giving them a reasonable exposure with only one fund similar to stock trading.

Nowadays ETFs, atypical funds, are a great commercial success and one of the main trading tools across most commodity and non-commodity markets. On 16 December 2010, ETF's assets achieved the $1 trillion USD mark so as we conclude, in just a few years this quite recent financial product conquered a big popularity and usage. It attracted many investors because of the intelligent and simple way that it allows a larger number of people to make a plain and consistent move on financial markets. All of this facts and being such an important product currently, made this approach of investing and performance analyzing ETFs very interesting and relevant to do on my thesis. So, on this step of my study I start to get into more detail and to present the most technical aspects that will go on and allow making the empirical study later.

Concerning ETF's creation process it involves a fund sponsor that initially determines the basket of securities to include, making former agreements with the authorized participants, typically large institutional traders due to facilitating more the creation of new ETF shares. Those participants then deliver the fund's underlying securities to the ETF manager and receive the ETF newly-created shares in exchange. They can decide whether to hold those or usually sell to institutional or retail investors through a broker-dealer. In the market we can commonly find indexing investing styles but there exists a considerable variety of investment styles.

The usual advantages of using ETFs have to do with tax advantages; those are designed to be tax efficient, since the transactions between the fund and the authorized participant described before are considered "in kind" transfers of securities instead of sales, avoiding taxable capital gains for both parties. Another important characteristic and advantage is that they can be traded at any time during market hours and can be sold short or margined. The excellent liquidity at low cost and low expense ratios allied to those advantages before constitute the explanation to why they attract so many investors. But they also have a negative side regarding brokerage costs and the risk of being traded at discount (Gastineau, 2001).

The particular type of ETFs that this thesis aims is commodity ETFs that also have a huge success. The first one to be traded was SPDR Gold Shares by State Street Global Advisors in November 2004 that tracks the physical commodity gold itself. However not all work this way as for example the natural gas futures-based ETFs that track plain futures contracts. The small problem is that these derivative-based ETFs usually incur in the contango problem, where the futures price is higher than the expected spot price, disappointing investors. Basically these ETFs track their benchmark as expected but those benchmarks will not track well spot prices, reason enough for some investors to avoid commodities. But on a general way, including commodity funds in a portfolio is benefic because it can increase performance while reducing portfolio's risk.

Along with ETFs we can find ETNs, Exchange-Traded Notes: a unsecured debt security that combines in some way aspects of bonds and ETFs because investors can trade those like the previous, however ETN returns are based on the performance of the market index minus applicable fees and no period coupons are distributed as no principal protection exists (Johnston, 2011). It is usual to consider those under the ETFs category because of its similarity.

Anyway, being ETFs or ETNs, some of these very popular and used tools as Zacks (2012: The Comprehensive Guide to Natural Gas ETFs) presents are: *United States Natural Gas Fund LP* (UNG), *VelocityShares 3x Inv Natural Gas ETN* (DGAZ), *First Trust ISE-Revere Natural Gas Idx* (FCG), *Alerian MLP ETF* (AMLP), along with many others that will be studied from the next chapter until the end of this thesis. As the title suggest it focuses on explaining how to invest in the US natural gas market with ETFs, characterizing those in detail and evaluating its current performance and tracking abilities. Additionally with a looking forward perspective more emphasized on the final chapter.

3.4 Market Outlook

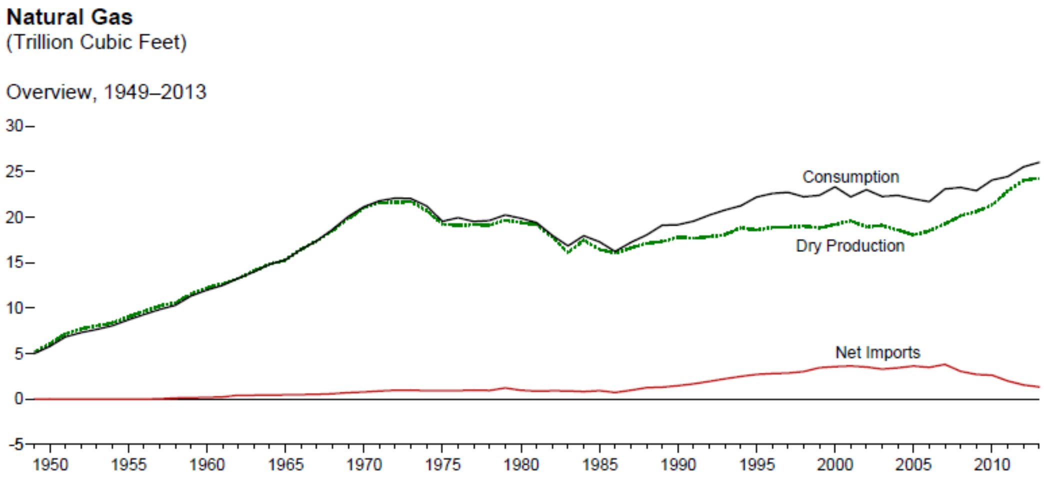
After understanding the mechanics of the U.S. natural gas market it is important to draw its outlook, giving an overview of the current situation on the essential variables such as consumption, production, storage and prices, so that we can understand what is going on in the market right now.

- **Overview**

Nowadays, natural gas usage is returning to its maximum after many years when oil was a primary source of energy. That tendency has inverted specially due to the comparably lower prices of natural gas as a consequence of many new and abundant shale reserves that are being discovered and explored recently and to less dioxide emissions incentive. As a result, dry production has been increasing since 2006/2007, reducing the net imports position and trying to reach the internal growing demand. It is already on the maximum historical levels and still growing as predicted by EIA Energy Annual Outlook (2013). It should be highlighted the usage of gas to produce electric power, a fact that shows that its importance has increased and now natural gas has a primary role as an energy source in the U.S.

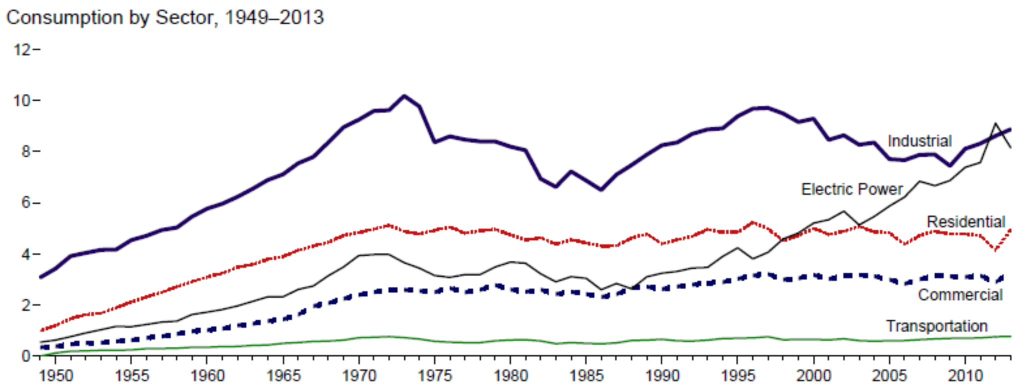
Figure 12

U.S. Natural Gas Outlook 1949-2013



Source: Energy Information Administration Annual Energy Outlook 2013

Figure 13



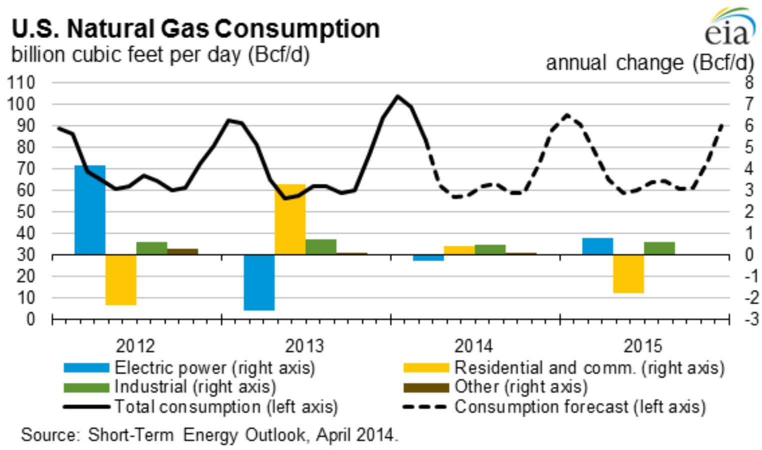
Source: Energy Information Administration Annual Energy Outlook 2013

Regarding this general view I also provide on **Annex 1** a better detailed relation of these variables in the most recent years and an EIA's monthly forecasted tendency (2014: Short-Term Energy Outlook), building a summary on the main market variables that will be analyzed bellow in detail.

- **Consumption**

Despite of low prices, total consumption was almost flat when compared to 2011 and 2012 with 3% and 4% growths respectively. One of the reasons was that coal regained some of natural gas's market share but as we observe on the last cold winter, natural gas demand increased and it recovered some usage due to heating requirements. Total Natural Gas consumption is expected to increase specially due to residential, commercial and industrial uses, offsetting the decrease in power generation because of natural gas higher prices. In 2015 consumption is expected to decline because of residential sector that offsets the again increasing use for power generation due to the dismantlement of some coal power plants.

Figure 14



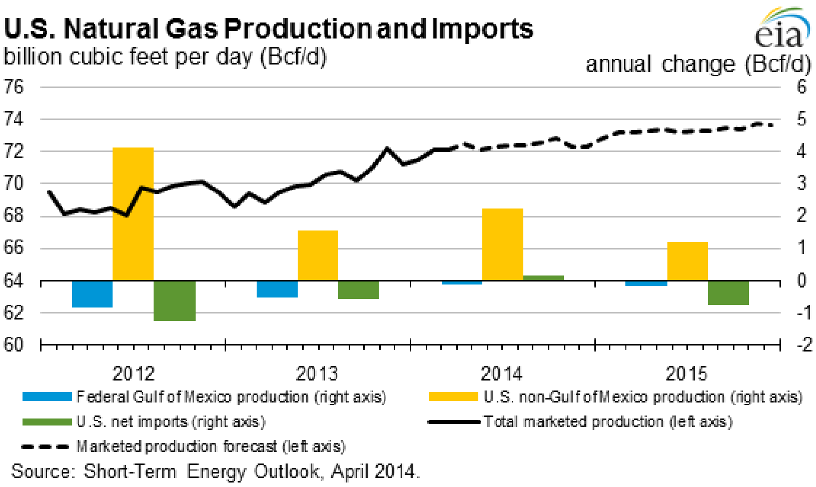
Annex 2 shows relevant information on some of the main factors that can influence natural gas consumption such as weather, disposable income and total industrial production. The last two are predicted to increase and so influencing positively the natural gas demand. As to weather predictions they have a larger margin of error, however the conclusion is always the same, the more strict seasons are with more events the more demand expands. Also a detailed graph shows the usage of power sources to generate electricity. The conclusion is straight forward, across years natural gas has been the big winner with an increase from 20.1% to 27.4% and coal the big loser source.

- **Production**

Since the last recent years production has been increasing on a consistent basis, meting the cyclical behavior of demand and now is regularly over 2 trillion cubic feet per day as observed on **Annex 1**. That first graph shows the really strict and cold winter of 2013/2014 with a very high total consumption that outbreaks the previous ones and production. As net imports did not increase much and stayed below 0.25, we conclude that natural gas storage played a very important role to fulfill all the recent demand all across the country. With so much production and reserves, still U.S. ran a shortage on supply this winter, a fact that arose some national concerns.

On general, in 2013, US average dry natural gas production increased only by 1%, a modest growth when compared to the previous years, 7% in 2011 and 5% in 2012, the lowest annual growth since 2005. EIA (2014) expects a growth of 3% in 2014 and 1.5% in 2015.

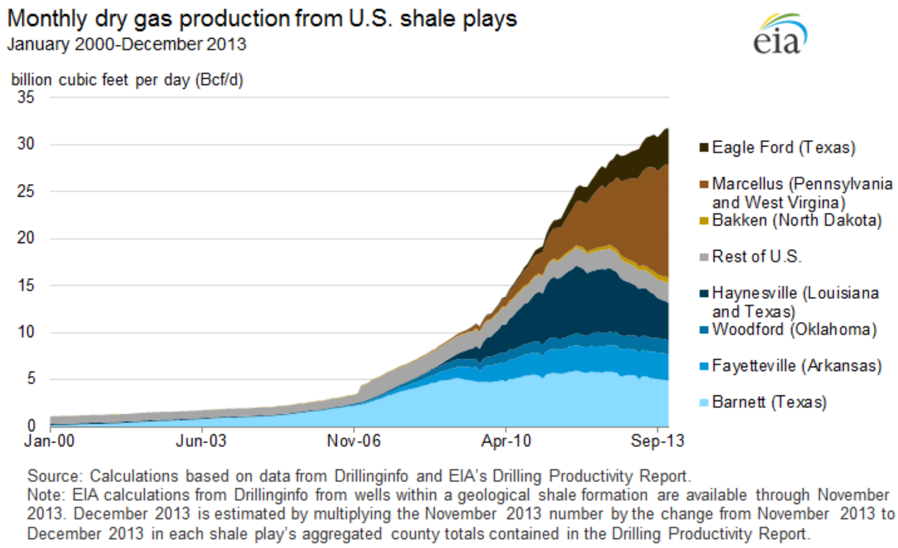
Figure 15



Since 2010, domestic production has satisfied 88% of US natural gas demand, as imports continue to decline decreasing from 16% of total demand in 2007 to much lower levels due to the increased capacity of production. Imports continue but on a more marginal basis, especially to fulfill on cold winters or to deal with maintenance scenarios. LNG imports have been declining because of higher prices in Europe and Asia that attract more the seller's side. Also, as a result of a growth in domestic production over the past several years, some pipeline imports from Canada have been displaced. On the other side, several companies are planning to build liquefaction capacity to export LNG from the US, scheduling it mainly for 2015. Actually, exports to Mexico have been increasing. EIA (2014) projects net imports in 2015 to be the lowest since 1987 and over the long term to US to be a net exporter of natural gas by 2018. **Annex 3** shows EIA's forecasts regarding natural gas imports/exports.

Regionally, Marcellus growth is contributing for lowering forward prices in the Northeast region, possibly to a level bellow Henry Hub's. This fact may make some drilling activity to move away from that shale play back to the Gulf Coast plays such as the influent Haynesville and Barnett that are more correlated with Henry Hub Prices. In 2013, Marcellus Shale revealed a very significant role on total production. The increased levels of dry gas output contributed much to the net increase in national production levels, contradicting the decrease in other basins. Since 2012, Marcellus Shale output rose 61%, from an average of 6.5 Bcf/d to 10.4 Bcf/d, as showed below, according to EIA's calculations. Infrastructure improvements lead to increased drilling that boosted its output. Outside of Marcellus the shift to liquids rich production continued last year because of the wide differences in natural gas and oil prices that affect capital deployment decisions, encouraging the target of regions with wetter gas and higher ROI's.

Figure 16

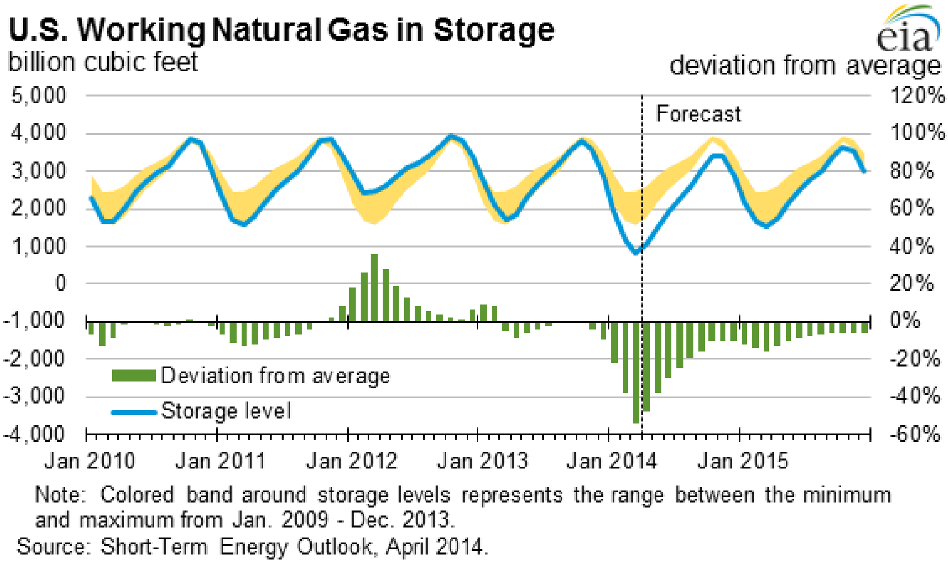


Forecasts made by EIA's Annual Energy Outlook 2014 Early Release (2014) on **Annex 3** confirm the big role of shale gas on the dry natural gas production on the next years as I will discuss later. So far, after 2 years, that tendency is being confirmed as discussed above.

- **Storage**

Storage reports show the consistent cyclical behavior and the larger capacity stored in 2012/2013, but more recently stored natural gas is falling to significant low levels as a response to last winter's extreme weather. Inventories they fell largely until April 2014 due to the extreme cold in winter and consequently expanded natural gas use for heating. Total stocks in all regions fell to minimum levels over a large range of time after some years of positive growth.

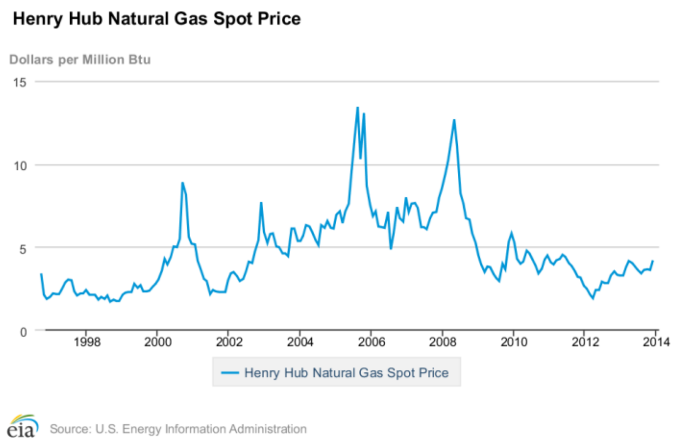
Figure 17



- **Prices**

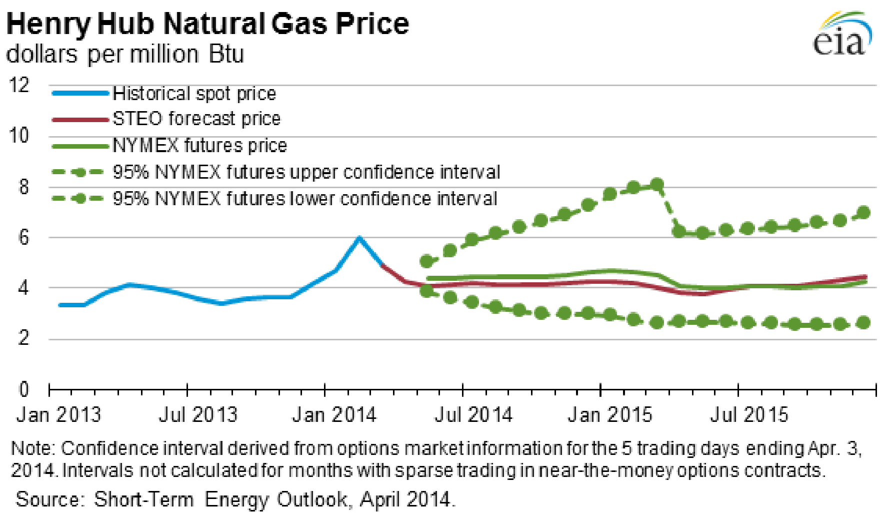
Natural gas reference prices for all United States, the Henry Hub spot prices, got extremely low after 2012 under $4 for million Btu, fact that even raised questions regarding the economic profitability of producing natural gas. New discovered shale reserves and the increased production, named "*the shale gas revolution*", led investors and speculators to believe that next years, natural gas will be abundant, making the supply much superior to the demand and so driving prices much down. However on this last winter due to extreme weather conditions in the US that we all assisted in the media resulted on an instant shortage on many states driving the general level of prices above and so Henry Hub spot price that surpassed $5. As studied before and confirmed, extreme weather can influence greatly the prices.

Figure 18



So, on a general basis average wholesale prices in 2013 increased significantly when compared to 2012. However they continue at their lowest level since 2012. After the significant winter events that made prices to sky rise to an average of $4.90/MMBtu at Henry Hub in March they decreased $1.10 as a result of the weather softening but still colder than normal. EIA (2014) projects a continued decline in the rest of the year to $4,11 in 2015. As to future's prices they averaged $4.46 for July 2014 with $3.40 and $5.87 as lower and upper 95% confidence interval bounds against an average of $4,07 for July 2013 with $3.16 and $5.23 bounds. Additionally, **Annex 4** shows the present and forecasted relation between natural gas and oil prices.

Figure 19



4 Data

On this section I present all the current natural gas ETFs available on the US market and their fundamentals. When we talk about investing on US natural gas through Exchange-Traded Funds, three categories arise: Futures based ETFs, Equity Indexes based ETFs and Master Limited Partnerships based ETFs. The main difference has to do with its composition and primary benchmark. Each category regards to ETFs composed by different kinds of financial tools, being those Henry Hub Futures contracts of various maturities, Equity Indexes composed of gas and oil companies' stocks and Master Limited Partnerships participations, another type of equity investing more focused on gas infrastructures and its utilities. **Annex 5** and **Annex 6** present the name and a brief description of the ETFs according to Bloomberg, symbol or ticker and a general profile of fundamentals, designating the fund's family, investment style and the primary benchmark.

Currently we can invest on 32 natural gas ETFs available on the US commodities market: 9 Futures-based, 5 Equity Indexes-based and 18 MLP-based. The symbols presented correspond to Bloomberg tickers when added ": UP" for the ETFs as they are all traded in NYSE Arca or ": IND" for the benchmarks. Bloomberg was the primary source for the data extraction that is updated until March 2014. Also the brief descriptions correspond to Bloomberg's profiles due to its relevance and accuracy as a financial tool when developing this thesis.

As shown, different ETFs share the same issuer. These companies or managers chose to launch more than one ETF to have the opportunity of covering more than only one index or investment strategy. Some of the most know are **United States Commodity Funds LL**, **Credit Suisse AG**, **ProShares**, **Direxion Funds**, **UBS AG** and **Global X Funds**.

Investment styles (or appropriations) differ significantly among funds, 23 out of 32 ETFs are based on **derivatives** and only 7 are **leveraged,** until three times proportional or inverse. **Full replication strategy** is also common among MLP-based funds that directly copy their index.

Regarding benchmarks, many of them are followed very closely by the ETFs that even share the same name and characteristics. Some other ETFs such as UNG, UNL, MLPC and EMLP do not follow any directly, so the primary benchmark is in this case S&P 500, a general index that indicates the performance of the US economy.

Annex 7, updated on 28/02/2014, presents the fundamentals for all ETFs on that day, first referring the inception date, which is very relevant because as we are going to observe there is quite a considerable difference on the number of observations among ETFs, that as we know have a big influence on the accuracy of the forecasts. The oldest have way more than 1000 and the newest ones less than 300 as will be reviewed on the empirical study section. **UNG**, the first to be issued on April 18th 2007, **UNL**, **GAZ**, **FCG**, **DDG** and **AMJ** were the ones issued earlier, all previously to 2010.

As mentioned before, all ETFs are traded on NYSE Arca [8] in U.S. Dollars, the same as their benchmarks.

As expected the largest ETFs present larger trading volumes but there are more factors to be considered such as the recent performance of the fund showed next chapter, making it more or less attractive, with huge implications on the trading volume. Currently, the most popular and traded ETFs, with over $ 100 m on the last 30 days average daily volume are **UNG** (United States Natural Gas Fund LP), **UGAZ** (VelocityShares 3x Long Natural Gas ETN), **DGAZ** (VelocityShares 3x Inverse Natural Gas ETN), **FCG** (First Trust ISE-Revere Natural Gas Index Fund), **AMJ** (JPMorgan Alerian MLP Index ETN), and **AMLP** (Alerian MLP ETF).

Assets follow very closely Market Capitalization due to using a similar formula on its calculation, where instead of using the outstanding price per share, the fund's asset size uses de NAV. As verified, across the funds, asset's size or current market capitalization range is huge. The largest funds according to market capitalization are **UNG** with $ 871,59 M, **DGAZ** with $ 379,16 M, **FCG** with $ 468,22 M, **AMJ** with $ 5,8 B, **MLPI** with$ 1,7 B, **AMLP** with $ 7,6 B (the largest natural gas ETF), **YMLP** with $ 266,04 M, **MLPN** with $ 702,34 M and **EMLP** with $ 469,34 M.

The number of shares out follows a similar guide line, being in some way proportional to the size of the fund but taking into account its outstanding price, possibly because of former stock splits. **AMLP** with the most, has 436,86 million shares outstanding against 80 thousand for **DDG**, the fund with fewer shares outstanding.

On the Futures-based ETFs, **UNG**, **UGAZ**, **GAZ** and **BOIL** were the only ones traded at premium if we consider an average of the last 52 weeks. **FRAK** on the Equity Indexes-based was also the only at premium. But on the other side, there were no Master Limited Partnerships-based ETFs traded at discount on that averaged period whereas data was available.

[8] Securities exchange in the U.S. on which stocks and options are traded owned by NYSE Euronext

Expense Ratio can be better described by Total Annual Fund Operating Expenses, meaning all of the fund's operating expenses expressed in percentage of the fund's average net assets. An expense ratio of 1% means that each year 1% of the fund's total assets corresponds to the value of operating expenses. This ratio is important because annual expenses impact on returns significantly. Some factors influence the expense ratio such as the size of the fund; the smallest usually spread expenses among less investors, increasing the ratio, management style of the fund and sales charges (Gastineau, 2001). **NAGS** (1,5), **UGAZ** (1,65) and **DGAZ** (1,65) are the funds with higher ratios, accounting for more than 1% on operating expenses.

Bid Ask spreads are specifically high for **NAGS**, with 0.47, **DDG** with 0.54 and **MLPG** accounting 0.31. On a general rule, bid ask spreads are higher for the low-volume funds, making this spread to wide considerably as we observe on **Annex 7.** The low-volume ETFs are those with higher spreads. As this fact impacts on purchase and sales prices, trading ETFs with large spreads can "eat" some of the potential returns.

Futures-based ETFs did not report any dividends while among Equity Indexes-based ETFs present mainly an irregular dividend distribution. MLPs-based funds have income type dividends distributed on a quarterly basis generally with considerable dividend yields.

5 Empirical Study

On this final section of my thesis I provide a technical analysis of the ETFs' performance, volatility, tracking abilities and time consistency. Finally I integrate all the studied topics into a looking forward perspective by analyzing the shale gas and LNG situations. These are the necessary steps to reach a broad and clear image for each of the available natural gas ETF, minding of the possible strategies to adopt and managing present and future expectations.

5.1 Performance

(i) Absolute and Active Returns

On this section I start by taking a simple and direct analysis on the ETFs' absolute returns and respective indexes absolutes returns to then compute the active or excess returns. Computing returns was achieved by:

$$r_t = \frac{Price_t}{Price_{t-1}} - 1 \qquad (1)$$

Where r^t refers to the percentage return of ETF on the day t, $Price_t$ refers to the closing price of the ETF on that same day and $Price_{t-1}$ to the closing on the previous day. The logic is the same for calculating the benchmark's absolute returns.

Active returns are calculated by: $$Active\ Return_t = r_t^{ETF} - r_t^{benchmark} \qquad (2)$$

Across the historical prices data I identified some interesting variables that contribute to this broad picture on performance. Variables such as the number of *Wins* (days when the ETF return beats the primary benchmark return) or *Losses* (the opposite) as well as the maximum straight sequence for both along the data. Apart from the *Wins* & *Losses* analysis I also present the arithmetic average of ETF returns as well as its benchmark. These are procedures to obtain the average excess return, considering all the observations on the database.

Table 2

Absolute and Active Returns

Symbol	Obs	Wins	%	Losses	%	Max Wins	Max Losses	ETF Return	Benchmark Return	Excess Return
UNG	1665	791	47,5%	874	**52,5%**	9	**11**	-11,8%	2,2%	-14,0%
UNL	1075	511	47,5%	564	**52,5%**	9	**10**	-6,6%	5,4%	-11,9%
NAGS	672	320	47,6%	352	**52,4%**	4	**6**	-6,8%	-4,7%	-2,1%
DCNG	462	235	**50,9%**	227	49,1%	4	4	-2,6%	-1,6%	-1,0%
UGAZ	515	263	**51,1%**	252	48,9%	17	8	15,4%	6,6%	8,7%
DGAZ	513	253	49,3%	260	**50,7%**	11	8	-24,4%	6,8%	-31,2%
GAZ	1595	777	48,7%	818	**51,3%**	11	7	-13,0%	-12,3%	-0,8%
BOIL	601	286	47,6%	315	**52,4%**	8	8	-11,1%	-4,6%	-6,5%
KOLD	598	313	**52,3%**	285	47,7%	8	**9**	7,5%	-4,7%	12,2%

Symbol	Obs	Wins	%	Losses	%	Max Wins	Max Losses	ETF Return	Benchmark Return	Excess Return
FRAK	511	259	50,7%	252	49,3%	5	5	3,2%	3,5%	-0,3%
FCG	1705	866	50,8%	839	49,2%	6	5	3,0%	3,0%	-0,01%
GASL	912	475	52,1%	437	47,9%	7	11	8,7%	3,7%	5,0%
GASX	895	421	47,0%	474	53,0%	7	11	-11,4%	3,9%	-15,2%
DDG	1295	624	48,2%	671	51,8%	11	8	-4,3%	1,5%	-5,8%
Symbol	Obs	Wins	%	Losses	%	Max Wins	Max Losses	ETF Return	Benchmark Return	Excess Return
AMJ	1233	634	51,4%	599	48,6%	11	5	7,4%	7,3%	0,1%
AMU	404	211	52,2%	193	47,8%	6	5	4,0%	3,8%	0,1%
MLPG	848	441	52,0%	407	48,0%	6	5	4,4%	4,1%	0,4%
MLPI	984	516	52,4%	468	47,6%	9	5	4,9%	4,7%	0,2%
AMLP	883	435	49,3%	448	50,7%	7	8	2,0%	4,7%	-2,8%
ENFR	80	38	47,5%	42	52,5%	4	3	5,3%	4,7%	0,7%
YMLP	493	232	47,1%	261	52,9%	7	7	-1,8%	0,2%	-2,0%
YMLI	262	122	46,6%	140	53,4%	9	5	2,0%	4,7%	-2,7%
MLPX	141	74	52,5%	67	47,5%	4	3	8,0%	9,0%	-1,0%
MLPA	97	37	38,1%	60	61,9%	4	8	6,7%	29,6%	-22,9%
MLPJ	278	126	45,3%	152	54,7%	6	6	2,2%	8,6%	-6,4%
MLPN	976	504	51,6%	472	48,4%	9	6	5,1%	5,1%	-0,02%
MLPY	715	373	52,2%	342	47,8%	8	6	0,7%	0,2%	0,5%
IMLP	274	139	50,7%	135	49,3%	4	7	5,4%	5,4%	-0,1%
ATMP	242	114	47,1%	128	52,9%	6	5	4,1%	4,0%	0,1%
MLPC	104	51	49,0%	53	51,0%	6	8	4,5%	8,7%	-4,1%
MLPW	525	276	52,6%	249	47,4%	9	6	6,5%	5,8%	0,7%
EMLP	423	198	46,8%	225	53,2%	7	7	4,7%	8,3%	-3,6%

We can identify a common pattern on the best relative performers by observing the average excess return. Those with significant positive active returns such as **UGAZ**, **KOLD** and **GASL** also have significantly more wins than losses. Even among those with only slightly positive returns, this pattern is followed and makes sense as we are talking about an arithmetic average calculated taking into account all the observations. A larger the number of wins always impacts positively on that mean. It should be highlighted the impressive number of consecutive wins for **UGAZ** that clearly presents itself as the strongest performance ETF.

Significant active returns again are achieved by **KOLD** (12,17%), **UGAZ** (8,73%), **GASL** (5,01%), **ENFR** (0,69%), **EMLP** (0,69%), being those the top 5 absolute performers, against the worst such as **DGAZ** (31,19%), **MLPA** (22,91%), **GASX** (15,22%), **UNG** (13,97%), **UNL** (11,94%).

It is also important to observe the evolution of absolute and active returns applied to more recent times, on a one year and six months' time windows, as **Annex 8** shows. To compute the returns for those time windows I simply used less and the correspondent observations, considering the latest 126 trading day's data for the 6 months window and 252 for the one year window.

Almost all the futures-based ETFs increased immensely its absolute return from negative to positive as we notice, except for **DGAZ** and **KOLD** that saw the exact opposite situation happening. All the indexes with no exceptions also improved its performance significantly, resulting on mixed improvements of active returns. **UNG**, **UNL**, **UGAZ** and **BOIL** improved a lot with **DGAZ** and **KOLD** registering astoundingly bad performances.

As for Equity Indexes-based ETFs all improved except **GASX** that was the opposite of **GASL** on huge performance changes. All indexes gave stronger positive returns which in the end resulted on mixed situations for excess returns with **GASL** as the big winner and its twin the inverse.

On general MLPs-based ETFs registered an inverse tendency when compared to the previous, however movements where much narrower as observed, revealing these fund's low volatility essence.

(ii) Risk-Adjusted Returns

One of the basic notions of finance is that riskier assets should have higher expected returns so that investors are properly rewarded for bearing this extra risk, as Gallagher (2005) agrees. So they always look forward to attain the highest possible return with the less risk possible. In order to evaluate that there are many risk-adjusted return measures to assure that the fund is doing its job effectively, not only looking only for the absolute returns that disregard a lot.

The Sharpe Ratio was developed by William F. Sharpe and is among the most common risk-adjusted return measures. Being a superior risk adjusted performance ratio, it measures the excess return of the ETF over the risk free rate, standardized by the standard deviation of its returns. However, when analyzing these funds performance, what is relevant to be considered as market is their primary benchmark. So instead of using the actual market risk free rate I use the return of the benchmark.

Summing up, the Sharpe ratio determines the expected realized return over the "minimum", how much additional return you are receiving for the additional volatility of holding the risky asset over its primary benchmark. The used formula is:

$$Sharpe\ Ratio\ = \frac{\bar{r}_{ETF}-\bar{r}_{benchmark}}{\sigma^{ETF}} \qquad (3)$$

Where $\bar{r}_{ETF}$ refers to the expected ETF percentage return computed by taking an arithmetic average of the ETF's historical returns, $\bar{r}_{benchmark}$ refers to the arithmetic average of the benchmark's historical percentage returns and σ^{ETF} refers to the standard deviation of ETF percentage returns.

Following a similar logic, the Treynor Ratio was developed by Jack Treynor and is very similar to the Sharpe Ratio but the denominator is the beta of the ETF instead of its returns standard deviation. Again, this beta is not referring to the market itself but to the primary benchmark. Thus it takes into account the systematic risk of the fund as beta refers to the sensitivity of the ETF to movements on its primary benchmark on this case. The higher Treynor ratio the better, meaning that the fund has a better risk adjusted return that the other. The used formula is:

$$Treynor\ Ratio\ = \frac{\bar{r}_{ETF}-\bar{r}_{benchmark}}{\beta_{ETF}} \qquad (4)$$

Additionally, β_{ETF} refers to the beta of the ETF, obtained by the regression of the ETF's returns on the benchmark's returns presented as: $r_t^{ETF} = \alpha_i + \beta_i r_t^{benchmark} + \varepsilon_t$ (5)

Despite this market/benchmark issues, I managed to adapt the previous ratios to cover the relevant focus. Something that is not necessary with the Information Ratio as its original purpose is to measure a fund's ability to generate excess returns relative to a benchmark, considering its tracking error. So the IR can be high by achieving a considerable active return, having high returns on the ETF and/or low returns on the benchmark and on the other side, a small tracking error.

The formula used is:

$$Information\ Ratio\ = \frac{\bar{r}_{ETF} - \bar{r}_{benchmark}}{TE_{ETF,bench}} \quad (6)$$

Additionally, $TE_{ETF,bench}$ refers to the tracking error of the ETF regarding its benchmark, the standard deviation of the regression presented above.

Sortino Ratio, created by Brian M. Rom is one of the most popular downside risk [9] measures. When we mention risk-adjusted returns, Sortino considers only the downside risk. Basically it is a modification of the Sharpe Ratio that only takes into account the returns bellows the target, the primary benchmark on this case. Simplifying, the standard error of the formula is only computed for the occasions where the ETF does not beat the benchmark. The rest is all the way equal to the Sharpe Ratio. So the used formula is:

$$Sortino\ Ratio\ = \frac{\bar{r}_{ETF} - \bar{r}_{benchmark}}{DR} \quad (7)$$

Where additionally DR refers to the downside risk:

$$DR = \sqrt{\frac{\sum_{n=1}^{N} Min((r_{ETF} - r_{benchmark,}),0)^2}{N}} \quad (8)$$

This way, the fund is not penalized by volatility but instead by negative active returns. It only depends on weather the investor wants on the ETFs general volatility or its threshold.

These are the four most common risk-adjusted return ratios that share the same bottom line: calculate the excess return per unit of risk. Obviously differences appear when formulas are slightly adjusted to account different kinds of risk as we observed above. Because of this fact we can only compare ratios among themselves and not with the others, despite of similarities. Anyway, at least all share the same conclusion, the higher the ratio, the greater the risk adjusted performance.

[9] Security's potential to decrease its value if any market conditions change

Table 3

Risk-Adjusted Returns

Futures-based ETFs	Symbol	Obs	Sharpe Ratio	Treynor Ratio	Information Ratio	Sortino Ratio
United States Natural Gas Fund LP	UNG	1665	-0,050	-0,675	-0,046	-0,064
United States 12 Month Natural Gas Fund LP	UNL	1075	-0,069	-1,372	-0,061	-0,082
Teucrium Natural Gas Fund	NAGS	672	-0,011	-0,024	-0,021	-0,029
iPath Seasonal Natural Gas ETN	DCNG	462	-0,006	-0,012	-0,011	-0,015
VelocityShares 3x Long Natural Gas ETN	UGAZ	515	0,012	0,032	0,018	0,027
VelocityShares 3x Inverse Natural Gas ETN	DGAZ	513	-0,042	0,114	-0,031	-0,042
iPath DJ-UBS Natural Gas Subindex TR ETN	GAZ	1595	-0,003	-0,009	-0,004	-0,006
ProShares Ultra DJ-UBS Natural Gas ETF	BOIL	601	-0,013	-0,035	-0,026	-0,039
ProShares UltraShort DJ-UBS Natural Gas ETF	KOLD	598	0,025	-0,066	0,017	0,023
Equity Indexes-based ETFs	**Symbol**	**Obs**	**Sharpe Ratio**	**Treynor Ratio**	**Information Ratio**	**Sortino Ratio**
Market Vectors Unconventional Oil & Gas ETF	FRAK	511	-0,002	-0,003	-0,005	-0,008
First Trust ISE-Revere Natural Gas Index Fund	FCG	1705	-0,00004	-0,0001	-0,0002	-0,0003
Direxion Daily Nat Gas Related Bull 3X Shares	GASL	912	0,011	0,021	0,017	0,025
Direxion Daily Nat Gas Related Bear 3X Shares	GASX	895	-0,034	0,063	-0,024	-0,035
ProShares Short Oil & Gas	DDG	1295	-0,027	0,069	-0,014	-0,020
MLPs-based ETFs	**Symbol**	**Obs**	**Sharpe Ratio**	**Treynor Ratio**	**Information Ratio**	**Sortino Ratio**
JPMorgan Alerian MLP Index ETN	AMJ	1233	0,001	0,001	0,002	0,003
ETRACS Alerian MLP Index ETN	AMU	404	0,002	0,001	0,003	0,004
ETRACS Alerian Natural Gas MLP Index ETN	MLPG	848	0,003	0,004	0,006	0,008
ETRACS Alerian MLP Infrastructure Index ETN	MLPI	984	0,002	0,002	0,005	0,007
Alerian MLP ETF	AMLP	883	-0,039	-0,039	-0,072	-0,090
Alerian Energy Infrastructure ETF	ENFR	80	0,011	0,007	0,023	0,036
Yorkville High Income MLP	YMLP	493	-0,027	-0,026	-0,046	-0,058
Yorkville High Income Infrastructure MLP ETF	YMLI	262	-0,044	-0,044	-0,058	-0,077
Global X MLP & Energy Infrastructure ETF	MLPX	141	-0,013	-0,010	-0,037	-0,050
Global X MLP ETF	MLPA	97	-0,141	-0,297	-0,305	-0,331
Global X Junior MLP ETF	MLPJ	278	-0,109	-0,101	-0,143	-0,174
Credit Suisse MLP Equal Weight Index ETN	MLPN	976	-0,0002	-0,0002	-0,0004	-0,001
Morgan Stanley Cushing MLP High Income Index ETN	MLPY	715	0,004	0,005	0,009	0,012
iPath S&P MLP ETN	IMLP	274	-0,001	-0,001	-0,001	-0,002
Barclays ETN + Select MLP ETNs	ATMP	242	0,001	0,001	0,002	0,003
C-Tracks ETNs on Perform. of M/H MLP Fundamental Index	MLPC	104	-0,062	-0,099	-0,057	-0,075
ETRACS Wells Fargo MLP Index ETN	MLPW	525	0,007	0,007	0,014	0,019
First Trust N.American Energy Infrastructure Fund	EMLP	423	-0,055	-0,056	-0,069	-0,091

In general terms, as we observe the Futures-based ETFs present weak returns for the amount of risk taken. This is explained because among the three categories, futures contracts are those that face more volatility and uncertainty when compared to equity indexes or MLPs. When we observe the equity side the final situation is mixed with a similar number of strong and weak performers. Among all, regarding the risk, **UGAZ** on the futures side, **GASL** on the equity indexes and **AMJ**, **AMU**, **MLPG**, **MLPI**, **ENFR**, **MLPY**, **ATMP**, **MLPW** on the MLPs side present solid performances with positive ratios.

Comparing among ETFs we can filter the two best and worst performers on each ratio:

- Sharpe Ratio: + **KOLD** (0,025) **UGAZ** (0,012) - **MLPA** (-0,141) **MLPJ** (-0,141)
- Treynor Ratio: + **UGAZ** (0,032) **GASL** (0,021) - **UNL** (-1,372) **UNG** (-0,675)
- Information Ratio: + **ENFR** (0,023) **GASL** (0,017) - **MLPA** (-0,305) **MLPJ** (-0,143)
- Sortino Ratio: + **ENFR** (0,036) **UGAZ** (0,027) - **MLPA** (-0,331) **MLPJ** (-0,174)

Annex 9 shows these measures on a more recent time window. On the futures-based ETFs, expect for **DGAZ** and **KOLD** for the reasons exposed before, all the measures improved positively. Many go from negative to positive as a result of this ETFs general improved performance. Treynor ratio was the most improved even on the case of the bad performers because **DGAZ** and **KOLD** replicate inversely their indexes, so the beta is negative.

On the Equity-Indexes based ETFs the situation was the opposite, in general all the risk-adjusted measures are worse nowadays adding exception for the amazingly performer **GASL** and to the inversely leveraged ETFs on the Treynor ratio perspective.

On MLPs-based ETFs, except some special cases as **AMJ**, **YMLP** and **EMLP**, the risk adjusted returns are approximately the same on most recent time windows as these funds are less volatile than the previous types so they experienced narrower performance changes.

5.2 Historical Volatility

On this section I present an historical volatility analysis, the rate at which securities move up or down or simpler, how much the fund price fluctuated during a given regular period of time; the annualized standard deviation of the daily price changes in the security (Gallagher, 2005). Basically it reflects the past price movements of the fund. Historical volatility can be in some ways an indicative of future volatility, depending on what drove the price changes during the past period.

It is called historical because it has a statistical base, using historical closing prices. Here I used 10 day, 30 days, 50 day and 100 day historical volatility but despite of different length, being annualized allows comparisons to be made.

Calculations involved returns defined as natural logarithms of close-to-close prices where:

$$r_t = ln\left(\frac{P_t}{P_{t-1}}\right) \quad (9)$$

Then calculating the average return over an *n-days* moving time window so that we can compute the standard deviation regarding that period of time. On this case, as mentioned before it was used:

$$r_w = \frac{\sum_{t=m}^{m-n} r_t}{n} \quad (10)$$

Finally the standard deviations were computed and then annualized using the formulas:

$$HV_m = \sqrt{\frac{\sum_{t=m}^{m-n}(r_t - r_w)^2}{n-1}} \quad (11)$$

$$HV_a = HV_m \times \sqrt{252} \quad (12)$$

When annualizing I used 252 that represents the average number of trading days per year [10]. This ways, different time windows for calculating volatility can be compared to obtain more complete conclusions. However choosing an appropriate period of observations "n" is not direct, as more data usually gives more accuracy but by another angle volatility does change over time and very old data may not be relevant for predicting the future. So the best solution is to consider a couple of time frames usually used by most investors and traders. (Gallagher. 2005)

[10] Usually calculated as "Total Days in a year – Weekends - Holidays – Half Trading Days"

Table 4 presents the standard deviation of returns using all the available data and afterwards the average n-day volatility of historical closing prices:

Table 4

Historical Volatility

Futures-based ETFs	Symbol	Obs	Returns' SE	10D	30D	50D	100D
United States Natural Gas Fund LP	UNG	1665	2,784	41,912	42,611	42,593	42,745
United States 12 Month Natural Gas Fund LP	UNL	1075	1,726	26,489	26,723	26,710	26,856
Teucrium Natural Gas Fund	NAGS	672	1,860	29,684	32,280	32,285	32,956
iPath Seasonal Natural Gas ETN	DCNG	462	1,580	23,955	24,221	24,192	24,631
VelocityShares 3x Long Natural Gas ETN	UGAZ	515	7,345	108,634	109,615	108,701	108,263
VelocityShares 3x Inverse Natural Gas ETN	DGAZ	513	7,465	112,973	114,522	113,552	112,777
iPath DJ-UBS Natural Gas Subindex TR ETN	GAZ	1595	2,965	43,314	44,376	44,548	45,237
ProShares Ultra DJ-UBS Natural Gas ETF	BOIL	601	4,864	71,600	73,405	73,429	73,994
ProShares UltraShort DJ-UBS Natural Gas ETF	KOLD	598	4,858	72,582	74,527	74,556	75,109
Equity Indexes-based ETFs	**Symbol**	**Obs**	**Returns' SE**	**10D**	**30D**	**50D**	**100D**
Market Vectors Unconventional Oil & Gas ETF	FRAK	511	1,393	21,509	21,949	21,997	22,192
First Trust ISE-Revere Natural Gas Index Fund	FCG	1705	2,472	34,457	35,466	35,810	36,622
Direxion Daily Nat Gas Related Bull 3X Shares	GASL	912	4,568	69,228	71,161	71,617	72,998
Direxion Daily Nat Gas Related Bear 3X Shares	GASX	895	4,540	70,185	71,709	72,158	71,578
ProShares Short Oil & Gas	DDG	1295	2,173	29,812	31,705	33,634	33,639
MLPs-based ETFs	**Symbol**	**Obs**	**Returns' SE**	**10D**	**30D**	**50D**	**100D**
JPMorgan Alerian MLP Index ETN	AMJ	1233	1,040	14,800	15,573	15,865	16,190
ETRACS Alerian MLP Index ETN	AMU	404	0,942	14,441	14,916	15,207	15,535
ETRACS Alerian Natural Gas MLP Index ETN	MLPG	848	1,085	15,852	17,497	17,518	17,904
ETRACS Alerian MLP Infrastructure Index ETN	MLPI	984	0,967	13,881	14,609	14,731	14,934
Alerian MLP ETF	AMLP	883	0,711	9,514	10,197	10,510	11,048
Alerian Energy Infrastructure ETF	ENFR	80	0,637	10,172	10,116	10,024	n.a.
Yorkville High Income MLP	YMLP	493	0,756	10,408	11,297	11,658	11,873
Yorkville High Income Infrastructure MLP ETF	YMLI	262	0,603	9,277	9,674	9,842	9,997
Global X MLP & Energy Infrastructure ETF	MLPX	141	0,748	12,068	12,552	12,580	12,575
Global X MLP ETF	MLPA	97	1,620	10,222	10,721	10,825	10,959
Global X Junior MLP ETF	MLPJ	278	0,586	9,195	9,711	9,912	10,273
Credit Suisse MLP Equal Weight Index ETN	MLPN	976	1,043	14,981	15,770	16,038	16,318
Morgan Stanley Cushing MLP High Income Index ETN	MLPY	715	1,120	15,698	16,240	17,008	17,852
iPath S&P MLP ETN	IMLP	274	0,816	12,988	13,157	13,672	13,998
Barclays ETN + Select MLP ETNs	ATMP	242	0,876	13,480	13,684	13,686	13,623
C-Tracks ETNs on Perform. of M/H MLP Fundamental Index	MLPC	104	0,664	10,471	10,909	11,106	10,914
ETRACS Wells Fargo MLP Index ETN	MLPW	525	1,051	13,708	14,417	n.a.	n.a.
First Trust N.American Energy Infrastructure Fund	EMLP	423	0,654	9,777	10,225	10,423	10,852

As we observe, annualized volatilities of the chosen time periods are very similar and have a direct relation with the returns' simple standard deviations, the larger, the higher historical volatilities the fund presents.

Master Limited Partnership's ETFs in general is the class that presents less volatility across the various time frames, any MLP fund present on the database is less volatile than any other belonging to the Futures-based or Equity Indexes-based. The largest volatility that we can find there is approximately 17,9% (100D **MLPG**) and the smallest 9,2% (10D **MLPJ**). This numbers are outrageously inferior to the others above due to the characteristics of MLP's-based ETFs. It can be explained because MLPs are equity-type indexes based on gas and oil infrastructures. Infrastructures are less liquid and volatile investments, not as news and events sensitive as for example the spot and future Henry Hub price of natural gas (explaining the high volatilities on the Futures-based ETFs), or the direct share on an oil and gas working company that can be significantly affected by news and events that originate decisions and investment strategies influencing its value and share price. So summing up, volatilities reflect the different risks and stability of investing in different types of financial instruments, by the order described above.

Annex 10 presents Historical Volatility graphs for each ETF individually to give a better notion of its evolution across time. From the graphs it is notorious that volatilities for smaller periods, from 10 days to 100 days, are more unstable across time due to less data used so daily changes have a big impact on general swing. To determine what level is volatility is considered normal on each fund I calculated it within various timeframes as stated before. Each fund has its unique level of volatility that varies in time. Being high means large fluctuations on the closing price which impacts on the risk associated with the ETF.

5.3 Tracking Abilities

This section evaluates the capacity of the ETFs to track their primary benchmarks. Based on the CAMP model, the most effective way to evaluate how well the benchmark is followed is using the regression:

$$r_t^{ETF} = \alpha_i + \beta_i r_t^{benchmark} + \varepsilon_t \qquad (13)$$

Where alpha, α_i, represents the constant of the model and the abnormal return of the fund above the predicted by its relation with the benchmark, and beta, β_i represents of the ETF returns to track the benchmark returns, a performance tracker as these funds are supposed to do (Gallagher, 2005). A positive alpha means that the fund often beats the benchmark and a beta close to 1 or other leveraged value shows that it closely tracks its index's performance.

Additionally and as showed before, r_t^{ETF} is the percentage return of the ETF for a specific day, $r_t^{benchmark}$ the percentage return of the benchmark for that same day and ε_t the error term of the regression.

So our expectation is that β_i=1* and $\alpha_i = 0$ since ETFs at best should be a perfect copy of their benchmarks. These will be the two tested null hypothesis. Also it is expected a high coefficient of determinationR^2, the closest to 1 possible, meaning that the regression line perfectly fits the data.

Using Eviews I run this regression several times by OLS (Ordinary Least Squares) for each ETF, using all the available data to obtain the estimates for alpha and beta as well as the R^2 of the regression. P-values are presented to examine the statistical significance of the previous variables under the null hypothesis stated previously. Usually when p > 0,05 there is low presumption to reject the null hypothesis.

F-Test is also performed using the F distribution to test if we reject or not the null hypothesis of the beta being equal to 1 / -1 or in case of the leveraged ETFs, to 2 / -2 or 3 / -3, depending on the leverage and proportionality. **Table 5** presents the results of the tracking abilities for each ETF.

Table 5

Tracking Abilities

Symbol	Primary Benchmark	*Obs*	Alpha	*p-value*	Beta	*p-value*	R^2	F-Test β=X	*p-value*
UNG	*S&P 500 Index*	*1665*	-0,122	*0,072*	0,207	*0,000*	0,013	311,163	*0,000*
UNL	*S&P 500 Index*	*1075*	-0,070	*0,181*	0,087	***0,081***	0,003	333,496	*0,000*
NAGS	*Teucrium Natural Gas Fund*	*672*	-0,027	*0,488*	0,886	*0,000*	0,713	27,763	*0,000*
DCNG	*Barclays Natural Gas Seasonal*	*462*	-0,013	*0,766*	0,837	*0,000*	0,662	34,391	*0,000*
UGAZ	*S&P GSCI Natural Gas ER*	*515*	-0,027	*0,729*	2,728	*0,000*	0,941	81,595	*0,000*
DGAZ	*S&P GSCI Natural Gas ER*	*513*	-0,058	*0,547*	-2,737	*0,000*	0,916	51,325	*0,000*

GAZ	*DJ-UBS Natural Gas TR*	*1595*	-0,028	*0,559*	0,836	*0,000*	0,592	89,362	*0,000*
BOIL	*DJ-UBS Natural Gas*	*601*	-0,026	*0,590*	1,847	*0,000*	0,943	67,654	*0,000*
KOLD	*DJ-UBS Natural Gas*	*598*	-0,012	*0,811*	-1,834	*0,000*	0,936	71,484	*0,000*
Symbol	**Primary Benchmark**	***Obs***	**Alpha**	***p-value***	**Beta**	***p-value***	**R^2**	**F-Test β=X**	***p-value***
FRAK	*MarketVectors Global Unc. Oil&Gas TR*	*511*	-0,002	*0,929*	0,980	*0,000*	0,85	1,248	***0,264***
FCG	*ISE-REVERE Natural Gas Index*	*1705*	0,001	*0,947*	0,973	*0,000*	0,967	39,073	*0,000*
GASL	*ISE-REVERE Natural Gas Index*	*912*	-0,003	*0,937*	2,444	*0,000*	0,929	613,232	*0,000*
GASX	*ISE-REVERE Natural Gas Index*	*895*	-0,021	*0,632*	-2,400	*0,000*	0,917	613,547	*0,000*
DDG	*DJ-US Oil & Gas*	*1295*	-0,031	*0,360*	-0,836	*0,000*	0,689	109,846	*0,000*
Symbol	**Primary Benchmark**	***Obs***	**Alpha**	***p-value***	**Beta**	***p-value***	**R^2**	**F-Test β=X**	***p-value***
AMJ	*Alerian MLP Index*	*1233*	0,003	*0,811*	0,975	*0,000*	0,851	4,544	*0,033*
AMU	*Alerian MLP Index*	*404*	0,001	*0,964*	1,009	*0,000*	0,733	0,075	***0,785***
MLPG	*Alerian Natural Gas MLP*	*848*	0,007	*0,751*	0,922	*0,000*	0,676	12,659	*0,000*
MLPI	*Alerian MLP Infrastructure*	*984*	0,003	*0,728*	0,963	*0,000*	0,904	13,366	*0,000*
AMLP	*Alerian MLP Infrastructure*	*883*	-0,014	*0,140*	0,715	*0,000*	0,841	742,439	*0,000*
ENFR	*Alerian Energy Infrastructure*	*80*	0,008	*0,807*	0,971	*0,000*	0,782	0,251	***0,618***
YMLP	*Solactive High Income MLP Index*	*493*	-0,020	*0,272*	0,781	*0,000*	0,719	98,811	*0,000*
YMLI	*Solactive High Infrastructure MLP Index*	*262*	-0,008	*0,674*	0,606	*0,000*	0,733	300,919	*0,000*
MLPX	*Solactive MLP Energy Infrastructure Index*	*141*	-0,012	*0,609*	1,019	*0,000*	0,874	0,351	***0,555***
MLPA	*Solactive MLP Composite Index*	*97*	-0,161	*0,011*	0,771	*0,000*	0,861	51,908	*0,000*
MLPJ	*Solactive Junior MLP Index*	*278*	-0,033	*0,133*	0,632	*0,000*	0,628	157,296	*0,000*
MLPN	*Cushing 30 MLP Index*	*976*	0,002	*0,881*	0,955	*0,000*	0,821	9,801	*0,002*
MLPY	*Cushing MLP High Income Index*	*715*	0,005	*0,803*	0,926	*0,000*	0,777	15,984	*0,000*
IMLP	*S&P MLP Index*	*274*	0,004	*0,862*	0,910	*0,000*	0,745	7,831	*0,006*
ATMP	*Atlantic Trust Select MLP Index*	*242*	0,003	*0,909*	0,940	*0,000*	0,762	3,080	***0,081***
MLPC	*S&P 500 Index*	*104*	0,009	*0,876*	0,417	*0,000*	0,205	51,379	*0,000*
MLPW	*Wells Fargo MLP Index*	*525*	0,010	*0,628*	0,941	*0,000*	0,787	7,659	*0,006*
EMLP	*S&P 500 Index*	*423*	-0,006	*0,766*	0,644	*0,000*	0,528	143,704	*0,000*

We can observe the results of the time series regression for each ETF using all data. It is curious that all the Futures-based ETFs present negative Alphas but not statistically significant for a standard 95% confidence level. Anyway, clearly they have not outperformed their benchmarks by this regression model, being the more negative **UNG**. On the Equity Indexes-based funds the conclusion is similar except for **FCG** which presents a very small positive alpha, not statistically significant as the others. Regarding the MLPs-based ETFs, all alphas are also not statistically significant for a 95% confidence level, except **MLPA**, but here slightly more than half present positive alphas. **MLPW** has the best positive alpha despite not statistically significant. **MLPA** accounts for the most negative alpha not only among MLPs-based funds but among all ETFs. And to support this, is the only fund with a statistically significant alpha. On its favor at least I highlight that **MLPA** is among the funds with fewer observations which does not give the same consistency in results, making this fund very vulnerable to events that can impact on its price.

When analyzing betas we conclude that most reflect that the ETFs copy consistently their benchmarks except for **UNG** (0,207), **UNL** (0,087), **YMLI** (0,606), **MLPJ** (0,632), **MLPC** (0,417) and **EMLP** (0,644). Regarding the first and last two this conclusion is expected as they do not have a primary benchmark, being composed by rough future contracts or companies' trusts. So they consider S&P 500 as the best comparable benchmark but not following it directly. The rest are close to the replicative multiplier that varies with leverage and proportionality of the replication. All are statistically significant and reject the null, expect **UNL** beta with a p-value of 0,081.

The Coefficients of Determination R^2 have a close relation with betas, the closer betas are the higher R^2 is usually. Again the ETFs that present the smallest are **UNG** (0,013), **UNL** (0,003), **MLPC** (0,205), **EMLP** (0,528). Again we observe the weak relation between these ETFs and the S&P 500 that is only a generic comparable benchmark due to the reasons presented before. As to the rest, R^2 being closer to 1 means that the model correctly fits the data of both returns, so that ETFs are fully invested on the indexes constituents' replicating it, as Gastineau (2004) concludes.

F-Tests were conducted regarding the Wald Test that is parametric statistical test, to test the true value of the parameter based on the sample estimate. So for each ETF the beta tested was different as mentioned before, depending on its investment style. Impressively, results on this test show that only **FRAK**, **AMU**, **ENFR**, **MLPX** and **ATMP** do not reject the null hypothesis of the beta being equal to its target, 1 on these cases. For all the others the beta estimated by the sample seems to be rejected as equal to its goal proposal.

To complete the tracking analysis I also computed the Tracking Errors (by three different methods), the Downside Risk and the Coefficient of Correlation between ETFs and benchmark returns.

The first Tracking Error, designated by "Tracking Error 1" was simply the standard errors of the regressions executed before for each ETF. On generic terms it represents de deviation of the performance of the ETF from the performance of its corresponding benchmark.

The second method, designated by "Tracking Error 2" is by calculating the average absolute differences between ETF returns and the corresponding benchmark index:

$$TE_2 = \frac{\sum_{t=1}^{n} |r_{ETF} - r_{benchmark}|}{n} \quad (14)$$

Where, r_{ETF} represents the return of ETF on day t and $r_{benchmark}$ represents the return of its benchmark on the same day t.

The third and last method that gives us the "Tracking Error 3" computes the standard deviation of return differences between ETFs and their corresponding benchmarks over n days:

$$TE_3 = \sqrt{\frac{\sum_{t=1}^{n} \left[(r_{ETF} - r_{benchmark}) - \overline{(r_{ETF} - r_{benchmark})}\right]^2}{n-1}} \quad (15)$$

Downside risk was computed as stated before as:

$$DR = \sqrt{\frac{\sum_{n=1}^{N} Min((r_{ETF} - r_{benchmark,}),0)^2}{N}} \quad (16)$$

Finally the returns correlation uses the Pearson Coefficient of Correlation formula for two related variables:

$$\rho_{r_{ETF}, r_{benchmark}} = \frac{\sum_{n=1}^{N} (r_{ETF} - \overline{r_{ETF}})(r_{benchmark} - \overline{r_{benchmark,}})}{\sqrt{\sum_{n=1}^{N} (r_{ETF} - \overline{r_{ETF}})^2} \sqrt{\sum_{n=1}^{N} (r_{benchmark} - \overline{r_{benchmark,}})^2}} \quad (17)$$

Fortunately, Excel can compute this formula in a very fast way using the CORREL function between the two sets of data.

Table 6 presents the results collected using the previous formulas for each ETF within its full sets of data.

Table 6

Tracking Errors

Symbol	*Obs*	Tracking Error 1	Tracking Error 2	Tracking Error 3	Downside Risk	Returns' Correlation
UNG	*1665*	2,7670	2,3221	3,0139	2,1696	0,112
UNL	*1075*	1,7240	1,5731	1,9729	1,4528	0,053
NAGS	*672*	0,9969	0,6878	1,0166	0,7266	0,844
DCNG	*462*	0,9194	0,6126	0,9521	0,6645	0,814
UGAZ	*515*	1,7827	3,6307	4,8525	3,2175	0,970
DGAZ	*513*	2,1700	7,5098	9,9920	7,4578	-0,957
GAZ	*1595*	1,8944	1,1217	1,9462	1,3819	0,769
BOIL	*601*	1,1657	1,8351	2,4591	1,6805	0,971
KOLD	*598*	1,2287	5,5654	7,3658	5,3504	-0,968
Symbol	*Obs*	Tracking Error 1	Tracking Error 2	Tracking Error 3	Downside Risk	Returns' Correlation
FRAK	*511*	0,5392	0,3774	0,5394	0,3785	0,922
FCG	*1705*	0,4467	0,2200	0,4517	0,3321	0,984
GASL	*912*	1,2194	2,1664	2,8731	2,0397	0,964
GASX	*895*	1,3108	4,7723	6,2950	4,3827	-0,957
DDG	*1295*	1,2122	2,6973	4,1430	2,8907	-0,830
Symbol	*Obs*	Tracking Error 1	Tracking Error 2	Tracking Error 3	Downside Risk	Returns' Correlation
AMJ	*1233*	0,4022	0,2408	0,4028	0,2942	0,922
AMU	*404*	0,4872	0,3203	0,4866	0,3594	0,856
MLPG	*848*	0,6182	0,3424	0,6225	0,4480	0,822
MLPI	*984*	0,2997	0,1761	0,3016	0,2309	0,951
AMLP	*883*	0,2835	0,2779	0,3846	0,3047	0,917
ENFR	*80*	0,2997	0,2060	0,2983	0,1936	0,884
YMLP	*493*	0,4013	0,2899	0,4394	0,3524	0,848
YMLI	*262*	0,3119	0,3355	0,4572	0,3488	0,856
MLPX	*141*	0,2663	0,2023	0,2656	0,1986	0,935
MLPA	*97*	0,6075	0,5647	0,7515	0,6918	0,928
MLPJ	*278*	0,3580	0,3323	0,4477	0,3677	0,792
MLPN	*976*	0,4416	0,2845	0,4436	0,3305	0,906
MLPY	*715*	0,5294	0,3384	0,5350	0,3938	0,881
IMLP	*274*	0,4132	0,2836	0,4184	0,3026	0,863
ATMP	*242*	0,4282	0,2208	0,4300	0,2846	0,873
MLPC	*104*	0,5948	0,5695	0,7259	0,5474	0,453
MLPW	*525*	0,4860	0,3477	0,4891	0,3533	0,887
EMLP	*423*	0,4498	0,3999	0,5203	0,3952	0,727

First, generally, this table shows that usually tracking errors calculated by the third method are substantially larger when compared with the others. We can define that TE3 > TE1 > TE2. By categories, it is notorious that MLPs-based ETFs track their indexes better than the rest. The larger tracking errors belong to **UNG**, **UGAZ**, **DGAZ**, **KOLD**, **GASX** and **DDG** that on a returns perspective stand as the ETFs that track less precisely their benchmarks' returns, presenting larger fluctuations of performance regarding the primary indexes. Despite of the quite acceptable betas, this has more meaning regarding volatility. When associated with the volatility analysis made before we conclude that it is precisely the ETFs with larger volatilities that now present the larger tracking errors, being more exposed to deviations as also research by Svetina (2008) and Wahal (2008) proves evidence.

Considering downside risk the conclusions are all the way similar to the tracking errors conclusions, as the logic is similar. Those six funds still continue to be the ones that present larger downside risk, meaning that are more exposed to suffer a negative widening gap on tracking its indexes if market conditions change and events happen. This means that the losses of the ETF can get bigger comparing to the benchmark or by other words, there is more predispositions of these ETFs to have more swings on negative active returns.

Returns correlation show if ETF returns and benchmark returns follow the same pattern, tendency, cycling and seasonality components [11]. It represents the basic relation between the evolutions of both returns. Being the Coefficient of Determination (R^2) squared, obviously the results show that the ETFs that previously presented higher R^2's also present a strong correlation, meaning that the strongly the model fits the data is a consequence of a strong relation between variables. **UGAZ**, **DGAZ**, **BOIL**, **KOLD**, most of the Equity Indexes-based ETFs and **AMJ**, **MLPI**, **AMLP**, **MLPX**, **MLPA** and **MLPN** showed returns strongly related with the correspondent benchmarks. In some cases, despite of the larger tracking error, a high correlation coefficient can be justified because what matters here is the following of the general returns' pattern, independently of the swing's frequency.

[11] Regular Time Series components

5.4 Time Consistency

Time Consistency analysis aims to show the evolution of the alpha, beta and tracking error for each U.S. natural gas ETF across time, since the creation date until now. To obtain that, using Eviews I computed the regression bellow several times for each ETF, using a sample moving window of 60 observations that corresponds to 60 trading days, giving us a trimestral analysis:

$$r_t^{ETF} = \alpha_i + \beta_i r_t^{benchmark} + \varepsilon_t \qquad (18)$$

By creating a program on Eviews I was able to run the regression several times for each fund with different samples that move across time. That program basically runs the regression above *n-60* times with different 60 observations, that constitute a moving upwards sample, from the first observation to the last one, always adding one more recent and excluding the oldest one. Afterwards, the program stores on matrix form the necessary coefficients of each regression. So in the end I collected *n*-60 estimations for alpha, beta and tracking error (the standard error of each regression), to graph those as time series and compare across funds.

Annex 11 shows the time consistency graphics obtained for the remaining ETFs. Conclusions are pretty straight forward; a common approach concludes that as expected when the tracking error increased the alpha revealed more positive or negative swings, accentuating its abnormal returns, as well as beta that has the tendency to get further away from its target. The opposite happens when tracking error and volatility decrease.

This general relationship between the three variables is verified for all the cases so I did not consider necessary an individual exhaustive analysis of time consistently of tracking abilities for each ETF, as in the case of historical volatilities where considerations are showed better by observing the graph.

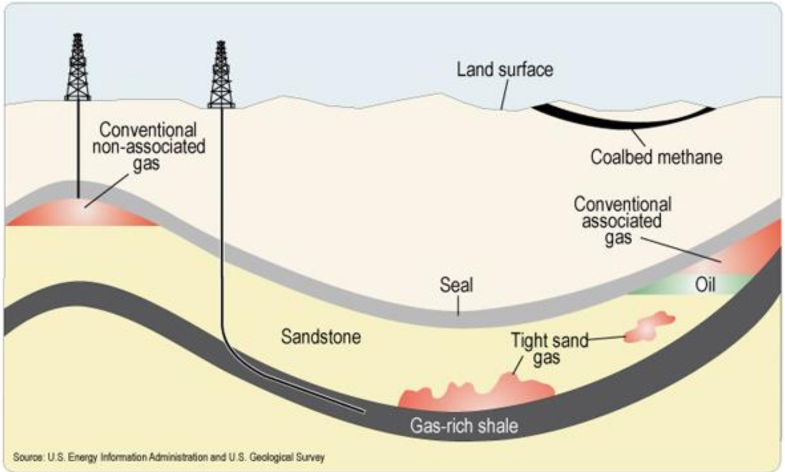
5.6 Future

5.6.1 The Shale Discussion

Shale gas refers to natural gas trapped within shale formations [12] that now is being explored due to technological advances that resulted in a combination of horizontal drilling and hydraulic fracturing, allowing the access to large volumes of shale gas that previously were uneconomical to explore. This discovery of how to extract natural gas from the abundant shale formations boosted immensely the natural gas industry all over United States since 2005 approximately. Production and reserves have increased largely and prices fell significantly to historically low levels, in a big part due to this turn-over.

Figure 20

Soil Geology



The availability and investment on exploring these large reserves of shale gas should enable US to rely only on internal supply of natural gas to satisfy its energy needs over the next years. And even produce more gas than it consumes, allowing exportation scenarios to the entire world, having a great impact on international prices of natural gas and on U.S. economy. Some factors favor the production of shale gas in the North American soil when compared to other countries worldwide:

[12] Fine-grained sedimentary rocks that can be rich sources of oil or gas

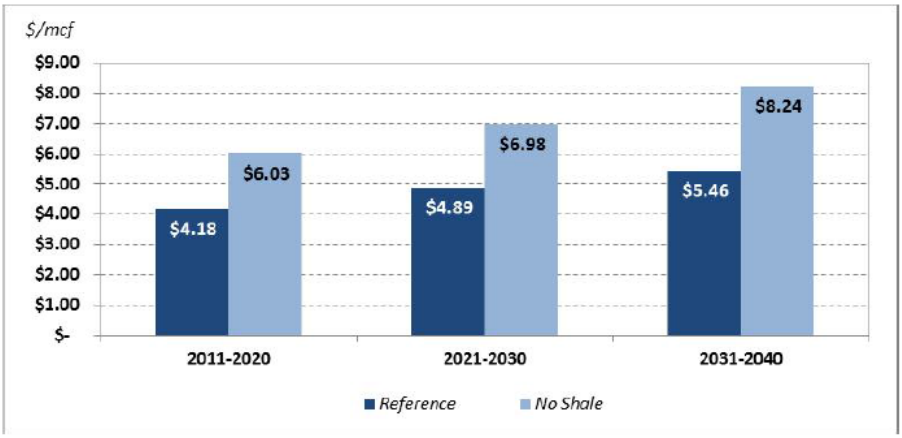
EIA on the International Energy Outlook (2013) enumerates the "*resource quality and geological distribution, major private ownership of subsurface mineral rights by surface owners that constitutes a strong incentive for development, big availability of many independent operators supporting contractors carrying huge expertise and advanced technology, a large pre-existing gathering and pipeline infrastructure and finally public acceptance of hydraulic fracking as well as wastewater disposal*". **Annex 12** shows the top ten countries with technically recoverable shale sources.

In the beginning of 2013 the US Energy Information Administration projected U.S. natural gas production to increase 44% between 2011 and 2040, from 23.0 trillion cubic feet by the beginning of the year to 33.1 trillion cubic feet, essentially due to the new exploration of shale formations. Nowadays, approximately 40% of U.S. dry gas production comes from shale gas and that percentage will tend to increase. Illustrating that is the fact that the number of wells drilling nationwide increased from 37% in 2007 to 56% in 2012. But not only this increase counts, the big improvement in drilling efficiency and well productivity has been one of the main drivers of this "boom".

As to price effects, Kenneth B Medlock III (2012) estimated that the domestic long run elasticity of supply would increase much, with shale gas being 1.52 and without 0.29. Traducing this in terms of prices we would observe something like this:

Figure 21

Shale Gas and Prices



* - Results derived from the Rice World Gas Trade Model (RWGTM). The RWGTM was developed by Ken Medlock and Peter Hartley at Rice University using the MarketBuilder software provided by Deloitte MarketPoint .

Source: K. B. Medlock III. *"A discussion of U.S. LNG exports in an international context"* (2012)

The main shale plays are Barnett Shale in Texas, Marcellus Shale on the Eastern, Haynesville and Eagle Ford near the Gulf Coast according to evidence presented by Sieminski (2014). These formations contain significant amounts of gas and similar geologic and geographic proprieties, making them very profitable formations to explore, test new technologies and obtain new information on shale gas. **Annex 12** shows all the shale plays on the lower 48 states. Their concentration is a sign of geographic and geologic unique characteristics only found in some areas of the United States of America. On a general basis the productivity of many oil and natural gas basins across the U.S. is steadily increasing as mentioned before and according to EIA's Annual Outlook (2013), the Eagle Ford Shale is leading in increased production of oil per rig as the Marcellus Shale is leading in increased production of natural gas per rig as **Annex 12** confirms.

This situation seems all the way great, however there are a lot of uncertainties associated with shale gas. What is the size of shale gas explorable reserves? Are all the shale formations possible to explore given that only a small area of most of the plays has been intensively tested? Most shale plays are being explored thoroughly on the last years, will this productivity maintain on the long term? What is the approximate amount of economic profitable shale formations? Will technology advances allow to increase well's productivity and reduce costs?

All this uncertainties have a considerable impact on the future of natural gas production, for example, by 2035 EIA (2013) estimates that shale gas production can be between 9.7 and 20.5 trillion cubic feet and total natural gas production between 26.1 and 34.1 trillion cubic feet. As we observe the margin of uncertainty is huge and impacts are many in both situations so every year EIA makes new forecast trying to accurate their predictions better.

As uncertainty was not enough, there are also environmental concerns regarding the shale gas extraction process. The fracturing wells need large amounts of water so as people need to consume in some areas where it is not so abundant, affecting its availability. Also aquatic habitats can be affected due to this intensive water use. By another side, there is always the risk of mismanaging the hydraulic fracturing fluid that may contain lots of potentially hazardous chemicals and can be accidentally released by leaks or faulty constructions, contaminating surrounding areas and exposing to great danger all the groundwater network. Wastewater after the extraction process is also another concern as it is rich in hazardous chemicals that need to be treated before disposal or reuse, not to contaminate any of the surrounding environments. Also recently and according to the United States Geological Survey (2012), hydraulic fracturing can cause small earthquakes, returning fracking fluids and wastewaters to the surface, an event that may cause bigger earthquakes of concern.

These are all big and important challenges concerning shale gas exploration and along with all the uncertainties exposed before make the shale gas revolution a very hot topic all around the media and academic studies, originating many opposite opinions and making the future of shale gas somehow an uncertain myth regarding its impacts on the U.S. economy. Some say that it is the savior and can put U.S. economy back on the top of the world such has *"Comeback"* by Charles R. Morris (2013) while others say it is a myth and not worthy of investment as *"Cold, Hungry and In the Dark"* by Bill Powers (2013), two different and opposite perspectives worth analyzing to open our mind to the pros and cons of shale gas investing.

But in the end, independently of positions, what keeps the investment on this source alive and well is the upward immense potential of transforming the global economy according to British Petroleum (2014) for example. If America is to be a future net exporter of natural gas it could have huge implications in dollar, U.S trade deficit, world trade and relations with China. BP's World Energy Outlook 2035 (2013) predicts that switch to 2018, impacting on a new era of industrialization. Currently, more than a half of U.S. deficit in goods and services comes from paying for imported fossil fuels, a scenario that would go away by the turn to an energy exporting nation.

Also worldwide a change in macro-economic imbalances would happen, since U.S could stop having huge trade deficit influencing a lot the trading system. Also BP (2013) forecasts that by 2035 the market shares of oil, coal and natural gas would converge to being equal at 27% approximately, originating a unique scenario where for the first time in the human history the world is not dominated by one fuel.

5.6.2 LNG to globalization

Liquefied Natural Gas is expected to have a very important role in the natural gas future and energy markets in general over the next decades. The U.S. shale gas "boom" is restructuring global natural gas markets, creating hopes to replicate its successes in similar shale formations all over the world, but more importantly creating a natural gas surplus and incentives to move it to higher-value global markets via LNG exports.

Figure 22

World LNG Estimated November 2013 Landed Prices

Source: Federal Energy Regulatory Commission, Market Oversight

Currently almost two dozen U.S. LNG export projects have been proposed and some other in Canada. Seven U.S. projects that have a capacity of 12.5% of the current production have received an approval for exports, making the total export capacity to top at 10 bcf/d by the end of this year. One of the approved projects is already under construction and first exports are expected to happen by the late year. Many of the proposed projects leverage existing LNG import infrastructures and tackle some regulatory issues, enjoying transportation advantages to the premium Asian markets to reduce the so important costs of supply (EIA, 2013).

LNG results from the conversion of natural gas into liquid form at standard atmospheric pressures by lowering its temperature to -260ºF and reducing its volume to 1/610th of its gaseous form. Although small scale transportation is still not cost effective, by using big cargo ships it becomes less costly enough to make LNG an economical alternative to domestic production of harder extraction areas. Reduce the oil dependency of many countries will require natural gas imports and that force is also driving LNG development. By increasing its number of costumers makes it economical to research better and develop new techniques that aim to reduce all the associated costs. So in the end, reducing the importing costs of natural gas and attracting more and more costumers, according to Medlock (2012) research.

This technology is used for supply operations mainly, such as imports and exports by cargo ships, domestic storage of natural gas and vehicle fuel. U.S. The current and expected abundant supply and constant lowering cost of liquefaction, degasifying, shipping and transportation are being the main drivers for companies to invest in LNG terminals. Several companies are announcing plans to build LNG import terminals and export facilities. Storage facilities also continue to be built in order to meet the peak of demand on strict seasons and to assure supply in areas where geologic conditions are not suitable for developing underground storage facilities as for example in New England or some middle Atlantic states. By another side, natural gas producers would benefit from being able to transport LNG overseas. Opening the U.S. and European markets to liquefied gas import would change the scenario; shipments could enter these markets from almost anywhere and feed their transcontinental pipeline systems (EIA, 2013).

Basically the LNG process involves three steps: liquefaction, transportation and regasification according to Edwards (2009). The last one is done at a regasification platform to be able to get the gas back to normal temperatures by warming it up and pumping it back into pipelines to deliver it to costumers. A great benefit would be the capacity to monetize the investments by building and using a liquefaction terminal and then sign long-term agreements to sell the product overseas, saving its value instead of only relying on a gas field that is only worth when gas is pumped into pipelines and sold instantaneously having no intrinsic value.

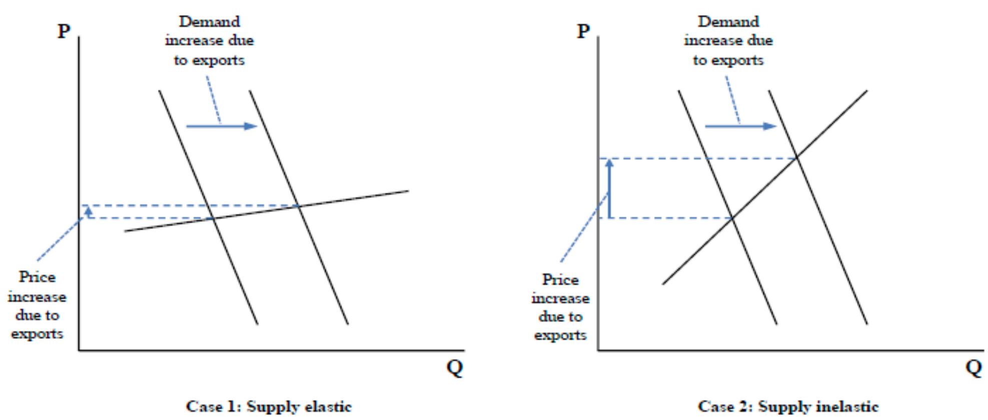
But some uncertainties remain: the huge amount of new global liquefaction capacity that has been proposed or is under construction presents a risk of destructive competition; uncertainty regarding Chinese gas supply and need for imports; uncertain Russian response to increasing gas demand from Europe poses a threat to the competitive edge of the exported LNG, depending on how much is Russia willing to go to preserve its Europe market share. Also some groups belonging to gas-intensive industries oppose to this developments fearing that it will increase substantially domestic gas prices. (Medlock, 2012)

Currently one weak point is still the reduced quantity of LNG terminals worldwide by economic and political reasons, blocking somehow more investment on this technology. Also LNG arises some concerns regarding the safety of the storage and regasification facilities as they contain a huge amount of fuel in a confined space. In case of a disaster this could cause catastrophic damage as the quantity of energy stored is huge. But this is unlikely as liquefied gas does not transit from liquid to gaseous rapidly enough to form the necessary overpressure of an explosion.

But the most important question here regards the impacts of investing in liquefied natural gas to a globalized natural gas market. First, the shale gas revolution until now decreased the U.S. LNG importations to very low levels and opened the possibility of LNG exportations. Logically, oil and gas prices were affected but due to a considerable elasticity of supply concerns are not large, it mitigated the potential for sustained long term increases in price as oil and gas prices continue to diverge. However this relation will also be driven by the exchange rate as we walk towards a full fuel switching capacity. As referred in *"A Discussion of US LNG Exports in an International Context"* by Medlock (2012), usually it can be claimed that with LNG exports U.S. price could increase substantially. Well, that would only be true if US domestic supply is highly inelastic as pictured bellow:

Figure 23

The Elasticity of Domestic Supply and the Impact of Exports on Price

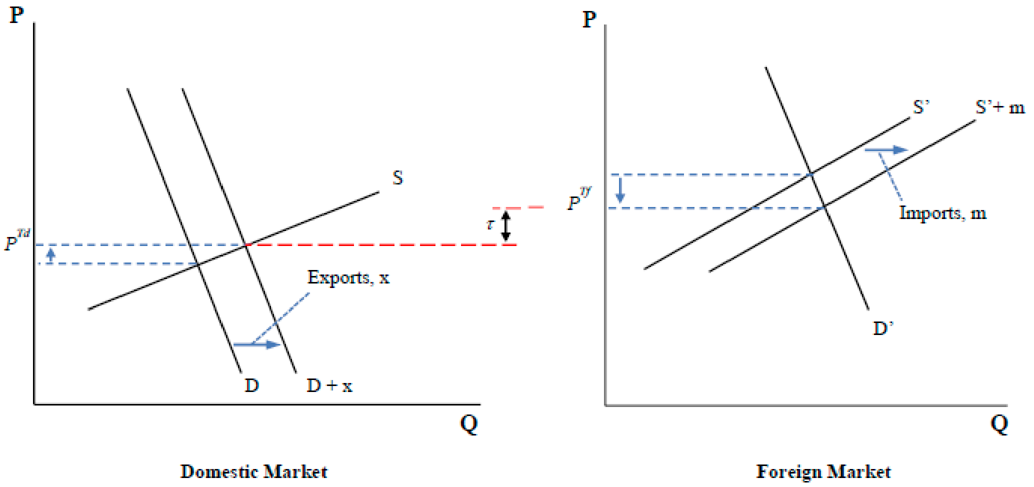


Source: Medlock "A Discussion of U.S. LNG Exports in an International Context", 2012

But currently the domestic supply curve is much more elastic due to new abundant reserves that resulted from the shale gas revolution analyzed before so it is unlikely that prices would increase much. Also according to this same study by Medlock (2012), impacts would be considerable on foreign importing markets. Price adjustments and responses happen in both sides, more or less depending on the elasticities of supplies and demands [13].

Figure 24

LNG Exports Impact



Source: Medlock "A Discussion of U.S. LNG Exports in an International Context", 2012

However behind price effects there are some other factors that need to be considered such as the short term capacity constraints to import/export natural gas, relations and interactions with foreign markets and exchange rates. But it seems that evidence is being gathered that U.S. LNG exports could put significant down-pressure on international natural gas prices.

Until 2008 international prices (U.S., Germany, U.K. and Japan) tended to move together showing some kind of convergence pattern despite of different level as the figure bellow shows. But since then the divergences are huge with U.S. registering huge decreases on its Henry Hub Natural Gas price due to the expanded supply and increased investment on shale resources.

[13] The more inelastic the larger effects on price occur

Figure 25

World Natural Gas Spot Prices

Source: BP Statistical Review of World Energy 2013

Currently the arbitrage value is high but associated with some risks according to Medlock (2012: 16): "*the price impact in foreign markets that could be significant*" as it changes relative elasticities, "*risk of foreign supplies developments*", and "*the exchange rate risk*" that affects the crude oil-gas price differential. Also as foreign gas is traded in own currencies, exchange rates effect on arbitrage opportunities. By another side, increases in supply elasticities can challenge the traditional pricing paradigms.

U.S. LNG export capacity could also be used for seasonal arbitrage opportunities by taking sufficient regional price differences to make exports profitable. Additionally a new link between global markets and storage could be made, as U.S possesses the most developed storage network worldwide that provides great liquidity to all of its market. Therefore that same liquidity could be affected by the level of exports.

[14] When capacity for direct arbitrage and fuel switching abilities are limited

6 Conclusion

Concluding this study means highlighting the most important and relevant aspects of the studied ETFs as well as connecting those to all the acquired market knowledge; past, present and future perspectives.

The most peculiar and interesting category, the futures based ETFs, clearly has UNG and DGAZ funds playing a central role, being the largest and most traded ETFs nowadays. Generally on this category we find some of the highest expense ratios and bid ask spreads. Additionally none of the funds reported any dividends. Due to its abnormally high number it is important to mention that GAZ is the ETF, among all, that is most premium-traded with an impressive 2.20% on a 52 weeks average. It should be highlighted that almost all the futures related funds and indexes registered a big improvement in performance since mid-2012; most of them went from negative to positive active returns, with UNG and UGAZ registering large positive returns, revealing themselves as awesome bets for investors. However DGAZ and KOLD performed badly registering huge losses. But in general all the risk-adjusted measures became consequently greater; especially Treynor ratios, revealing good active performances and consistent tracking capacities, especially on the leveraged ETFs that follow very close their benchmarks. However and due to futures and prices characteristics, this is the most volatile category with some volatility record breakers funds such as UGAZ and DGAZ, not indicated at all for risk-averse investors.

Connecting to the actual market scenario and knowing that futures contracts' performances are much based on price's evolution, we observe that the recent good performance of this category, both ETFs and benchmarks, is associated with the rising prices of natural gas since mid-2012, after a clear declining tendency post-2008 that contributed to the futures associated funds bad performances and subsequently fame. This consistent price decline was caused by the new discovered reserves, enhanced supply and enthusiasm caused by the shale gas revolution, when it started around 2008. But since 2012 the shale gas "excitement" seems to be stabilizing and faced with more skepticism and caution, having resulted, among other factors, on consistent price increase to production profitable levels for natural gas companies. Also the last two winters were strict and revealed some punctual supply shortages. So the general price increased, which is always positive for most forward contracts. However, now, natural gas prices are predicted to remain relatively stable and low, bellow $5 dollars and so the expected gains with futures-based ETFs should narrow and be more momentum-based.

Equity Indexes based funds category is composed by smaller ETFs that despite of some absolute performance improvements, did not achieve the same improvements on active returns as futures based ETFs. It is important to have in mind that some funds such as FRAK and DDG follow mixed Oil and Gas indexes, so the performances of these do not rely only on the evolution of the natural gas market. Average active returns improvements are mixed; more than half maintained their negative performances and generally the risk adjusted measures are negative. Exception is made for GASL, the only big winner of this category, so we can say that in general they performed worse than the futures based ETFs. GASX on the other end performed badly as it is the opposite strategy of GASL, ideal for Bear markets. These two funds distinguish themselves from the others in terms of return's volatility because they are not purely based on indexes replication. Derivatives-based strategies are included and so the relationship with prices is more similar to the previous category. All this funds replicate relatively well their benchmarks and the presented historical volatilities are high, similarly to futures based ETFs, especially on the derivatives based funds and ISE-REVERE benchmarked.

The last category, ETFs based on Master Limited Partnerships, refers much to natural gas/oil equities and infrastructures. If it is true that we have been seeing the natural gas supply expanding on the last years, on the other side, economic profitability of many supply agents and infrastructures has not been on its best, given the low prices that, as mentioned before, arose some viability and breakeven questions. Also the shale developments are basically happening just on some big shale plays and LNG terminals are not more than projects yet. So given this and the oil mixed component, there is clearly a declining tendency on performance contradicting specially the futures based ETFs that are on an upward scenario. Adjusting to risk these ETFs often present close to zero measures, a mix between positive and negative indicators. Containing some of the largest in market capitalization but also recent funds, this category is more adequate for risk-averse investors that want to face very small volatilities and prefer premium traded funds with quarterly distributed income type dividends that bear a high yield on general.

Looking forward there is an expectation that more shale gas will be explored and more LNG terminals will be built in order to increase production, aiming to cover all the domestic demand and turn the natural gas trading balance positive, by exporting the surplus internationally via LNG network. Many questions surround these two issues but at least there are some game-changer plans in mind for the U.S energy market that consequently would have a huge and essential impact on the economy over the next decades.

Bibliography

Bros, T. 2012. ***After the U.S. shale gas revolution***. Paris: Editions Technip.

Edwards, D. W. 2009. ***Energy trading & investing – Trading, risk management and structuring deals in the energy markets.*** New York: McGraw-Hill Finance & Investing.

Gallagher, D.R., Segara, R., 2005. The performance and trading characteristics of exchange traded funds. ***The University of New South Wales***.

Gastineau, G.L., 2001. Exchange-traded funds: an introduction. ***Journal of Portfolio Management***, 27: 88–96.

Gastineau, G.L., 2004. The Benchmark Index ETF Performance Problem. ***Journal of Portfolio Management***, 30: 96-104.

Jared Cummans; 25 Ways to Invest in Natural Gas; Commodity HQ; *http://commodityhq.com/2011/25-ways-to-invest-in-natural-gas/*; November 21, 2011.

Levi, M. 2013. The Energy Opportunity. In M. Levy, ***The power surge: Energy, opportunity and the battle for America's*** future, chap 8: 195-212. New York: Oxford University Press

Medlock III, K. B. 2012. A discussion of U.S. LNG exports in an international context. ***James A Baker III Institute for Public Policy Rice University***, 2-17.

Michael Johnston; The Ultimate Guide to Natural Gas Investing; Commodity HQ; *http://commodityhq.com/2011/the-ultimate-guide-to-natural-gas-investing/*; June 9, 2011.

Sieminski, A. 2014. Outlook for U.S. Shale Oil and Gas. ***Argus Americas Crude Summit***.

Svetina, M. and S. Wahal, 2008. Exchange Traded Funds: Performance and Competition, ***Arizona State University***.

U.S. Energy Information Administration. 2011. Review of the Emerging Resources: U.S. Shale Gas and Shale Oil Plays, DE-EI0000564, 5-9, 19-23, 25-29, 29-33, 37-41, 51-55.

U.S. Energy Information Administration. 2013. Annual Energy Outlook 2013, DOE/EIA-0383(2013): 39-44, 48-55, 55-61, 76-80, 100-103.

U.S. Energy Information Administration. 2013. International Energy Outlook 2013, DOE/EIA-0484(2013): 41-56.

U.S. Energy Information Administration. 2014. Short-Term Energy and Summer Fuels Outlook, DOE/EIA-STEO(A2014): 7, 11-12, 14-25.

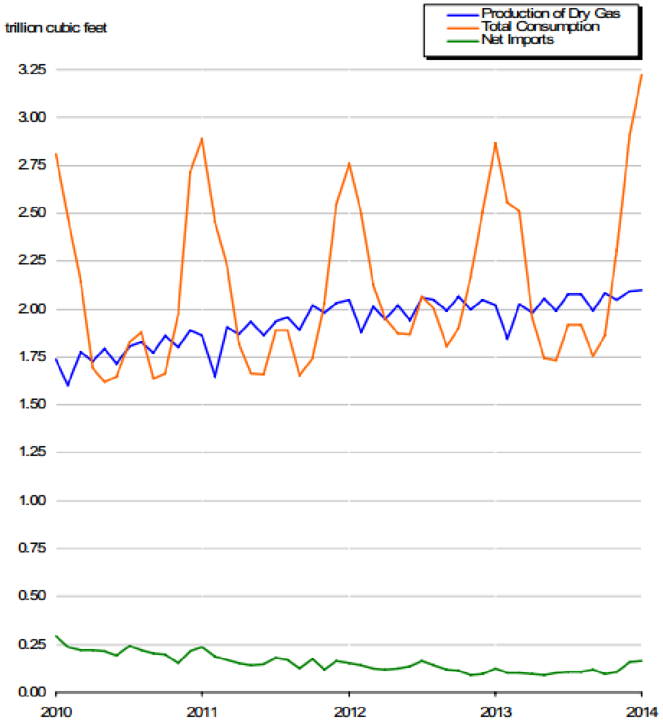
U.S. Energy Information Administration; Factors Affecting Natural Gas Prices; Energy Explained; *http://www.eia.gov/energyexplained/index.cfm?page=natural_gas_factors_affecting_prices*; April 23, 2013.

Zacks ETF Research; The Comprehensive Guide to Natural Gas ETFs; Zacks; *http://www.zacks.com/stock/news/81820/The-Comprehensive-Guide-to-Natural-Gas-ETFs*; August 28, 2012.

Annex

Annex 1

Market Outlook: Overview

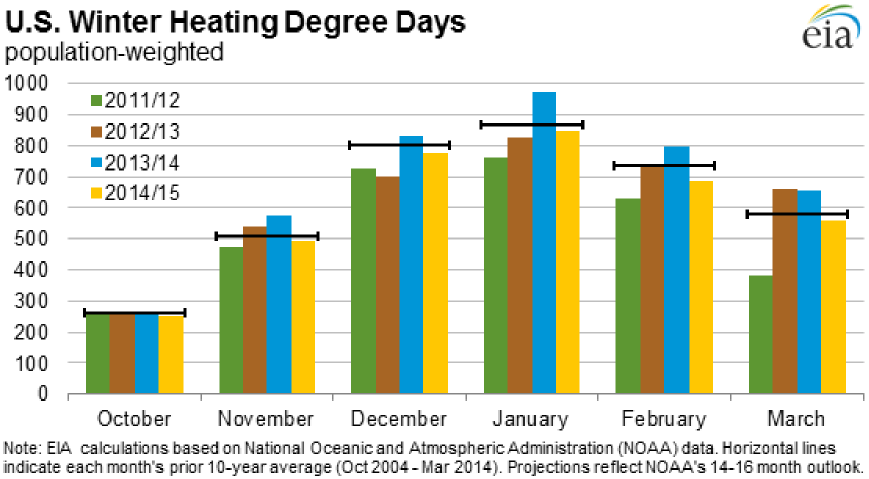


U.S. Natural Gas Summary	2012	2013	2014	2015
Prices	(dollars per thousand cubic feet)			
Henry Hub Spot	2.83	3.84	*4.58*	*4.23*
Residential Sector	10.69	10.31	*11.07*	*11.51*
Commercial Sector	8.09	8.12	*9.12*	*9.34*
Industrial Sector	3.88	4.66	*5.41*	*5.21*
Supply	(billion cubic feet per day)			
Marketed Production	69.15	70.18	*72.29*	*73.34*
Dry Gas Production	65.73	66.53	*68.45*	*69.45*
Pipeline Imports	8.10	7.63	*7.96*	*7.50*
LNG Imports	0.48	0.27	*0.23*	*0.22*
Consumption	(billion cubic feet per day)			
Residential Sector	11.34	13.53	*13.87*	*12.67*
Commercial Sector	7.91	9.01	*9.11*	*8.56*
Industrial Sector	19.74	20.45	*20.91*	*21.49*
Electric Power Sector	24.89	22.34	*22.06*	*22.85*
Total Consumption	69.76	71.33	*72.07*	*71.71*

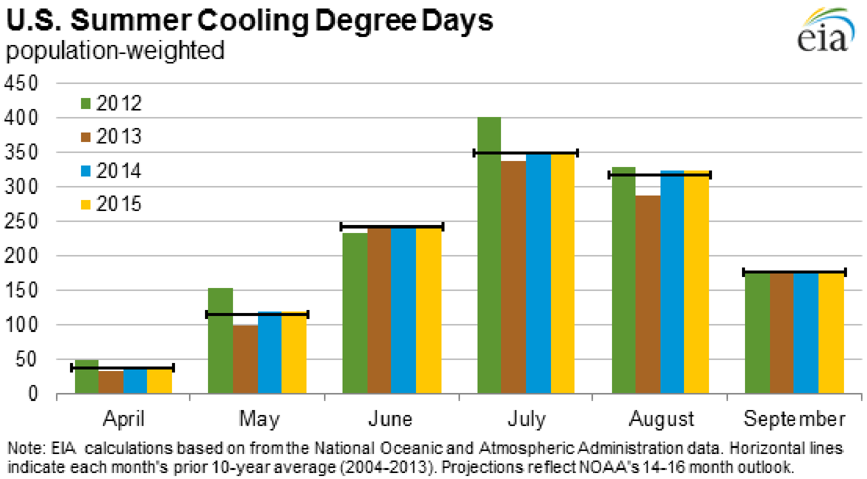
Source: Energy Information Administration Short Term Energy Outlook 2014

Annex 2

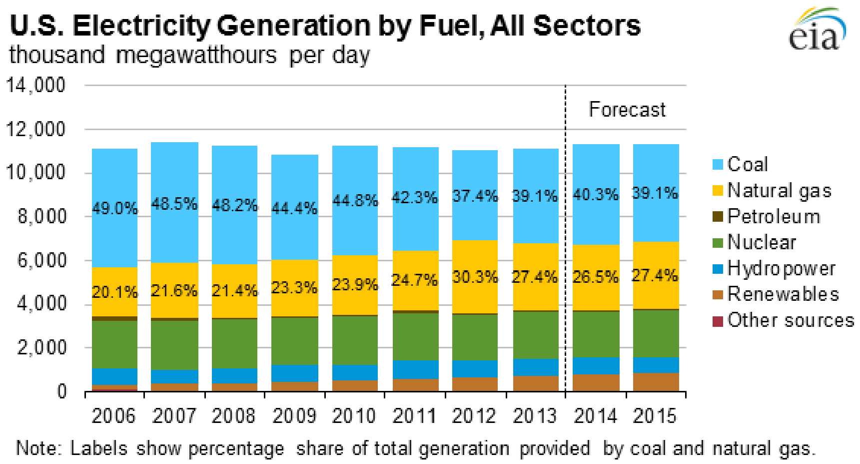
Market Outlook: Consumption



Source: Short-Term Energy Outlook, April 2014.

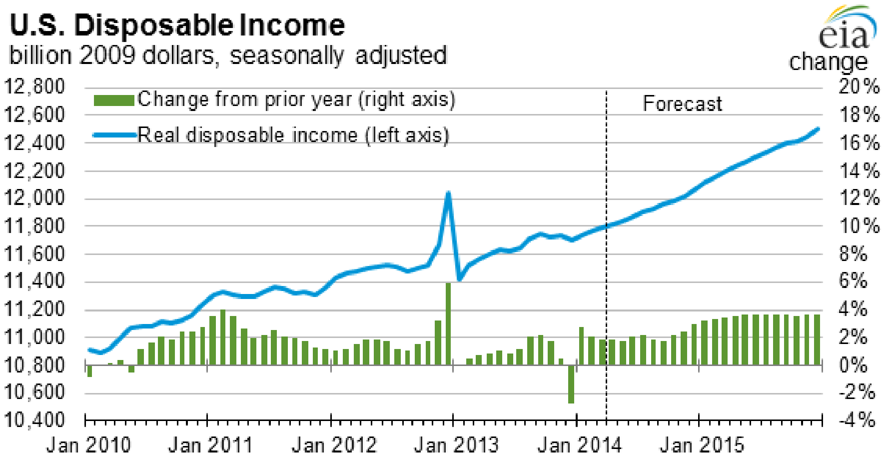


Source: Short-Term Energy Outlook, April 2014.

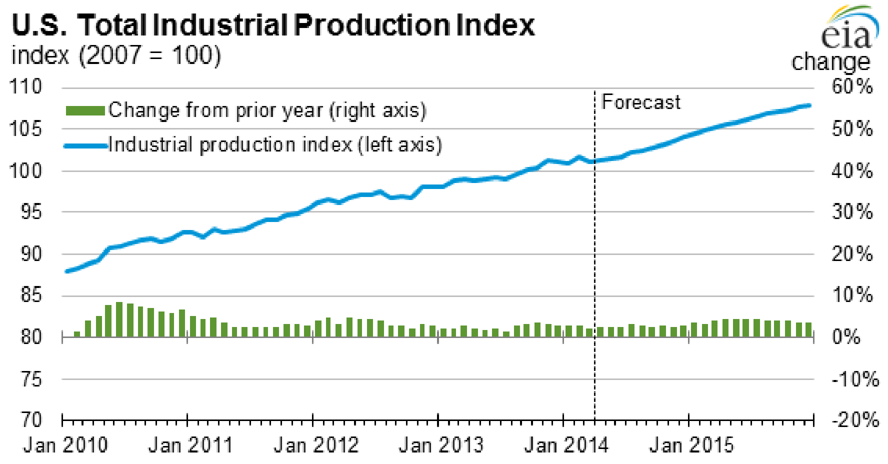


Note: Labels show percentage share of total generation provided by coal and natural gas.

Source: Short-Term Energy Outlook, April 2014.



Source: Short-Term Energy Outlook, April 2014.

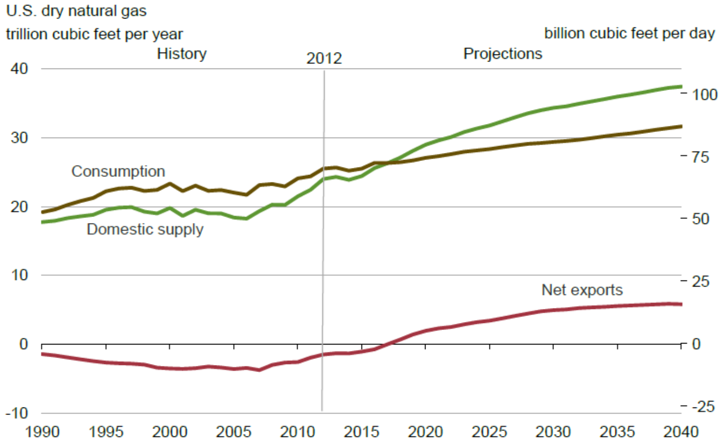


Source: Short-Term Energy Outlook, April 2014.

Annex 3

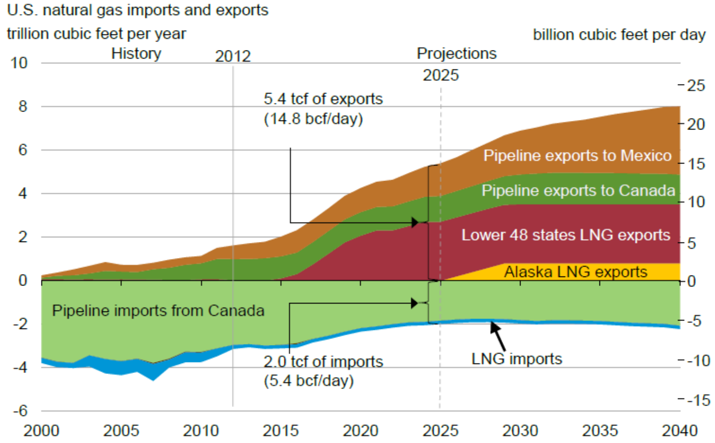
Market Outlook: Production

U.S. becomes a net exporter of natural gas in the near future



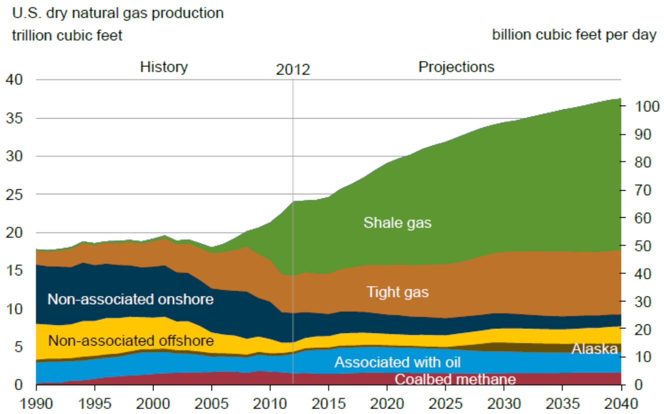
Source: EIA, Annual Energy Outlook 2014 Early Release

U.S. natural gas gross exports exceed 5 tcf in 2025



Source: EIA, Annual Energy Outlook 2014 Early Release

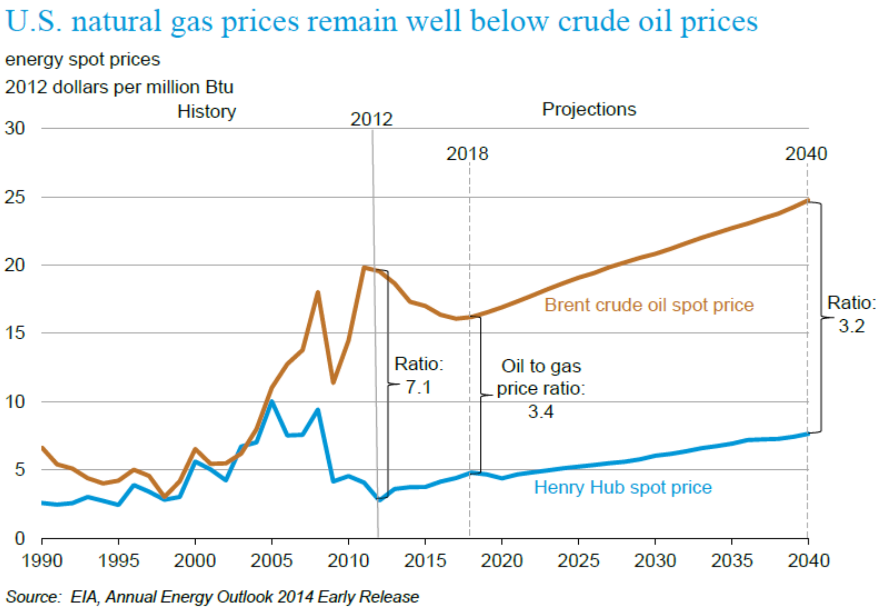
U.S. shale gas leads growth in total gas production through 2040 to reach half of U.S. output



Source: EIA, Annual Energy Outlook 2014 Early Release

Annex 4

Market Outlook: Price



Annex 5

ETFs Descriptions

Futures-based ETFs	
United States Natural Gas Fund LP **(UNG)**	United States Natural Gas Fund LP is a Delaware limited partnership incorporated in the USA. The Fund's objective is to have changes in percentage terms of its unit's net asset value reflect the changes of the price of Natural Gas delivered to Henry Hub, Louisiana, as measured by changes in percentage terms of the price of the Natural Gas futures contract on the NYMEX.
United States 12 Month Natural Gas Fund LP **(UNG)**	United States 12 Month Natural Gas Fund LP is an exchange traded fund incorporated in the USA. The Fund's objective is to have changes in percentage terms of its unit's net asset value reflect changes of the price of Natural Gas delivered to Henry Hub, Louisiana, as measured by changes in percentage terms of the price of an avg of the next 12 month's Natural Gas futures contracts on NYMEX.
Teucrium Natural Gas Fund **(NAGS)**	Teucrium Natural Gas Fund is an exchange-traded fund incorporated in the USA. The investment objective of the Fund is to have the daily changes in percentage terms of the Fund's NAV per Share reflect the daily changes in percentage terms of a weighted average of the closing settlement prices for four natural gas futures contracts traded on NYMEX.
iPath Seasonal Natural Gas ETN **(DCNG)**	The iPath Seasonal Natural Gas ETN is an exchange-traded note issued in the USA. The Notes will provide investors with a cash payment at the scheduled maturity or early redemption based on the performance of the underlying index, the Barclays Capital Natural Gas Seasonal TR Index.
VelocityShares 3x Long Natural Gas ETN **(UGAZ)**	VelocityShares Daily 3x Long Natural Gas ETN is an exchange-traded note issued in the USA. The Note will provide investors with a cash payment at the scheduled maturity or early redemption based on the performance of the underlying index, S&P GSCI Natural Gas Index ER.
VelocityShares 3x Inverse Natural Gas ETN **(DGAZ)**	VelocityShares Daily 3x Inverse Natural Gas ETN is an exchange-traded note issued in the USA. The Note will provide investors with a cash payment at the scheduled maturity or early redemption based on the performance of the underlying index, S&P GSCI Natural Gas Index ER.

iPath DJ-UBS Natural Gas Subindex TR ETN **(GAZ)**	iPath Dow Jones-UBS Natural Gas Total Return Sub-Index ETN is an exchange-traded note issued in the USA. The Notes will provide investors with a cash payment at the scheduled maturity or early redemption based on the performance of the underlying index, the Dow Jones-UBS Natural Gas Total Return Sub-Index.
ProShares Ultra DJ-UBS Natural Gas ETF **(BOIL)**	ProShares Ultra DJ-UBS Natural Gas is an exchange-traded fund incorporated in the USA. The Fund will seek daily investment results that correspond to twice (200%) the performance of the Dow Jones-UBS Natural Gas Sub-Index.
ProShares UltraShort DJ-UBS Natural Gas ETF **(KOLD)**	ProShares UltraShort DJ-UBS Natural Gas is an exchange-traded fund incorporated in the USA. The Fund will seek daily investment results that correspond to twice the inverse (-200%) the performance of the Dow Jones-UBS Natural Gas Sub-Index.
Equity Indexes-based ETFs	
Market Vectors Unconventional Oil & Gas ETF **(FRAK)**	Market Vectors Unconventional Oil & Gas ETF is an exchange-traded fund incorporated in the USA. The Fund seeks to replicate as closely as possible, before fees and expenses, the price and yield performance of the Market Vectors Unconventional Oil & Gas Index.
First Trust ISE-Revere Natural Gas Index Fund **(FCG)**	First Trust ISE-Revere Natural Gas Index Fund is an exchange-traded fund incorporated in the USA. The Fund seeks investment results that correspond to the ISE-Revere Natural Gas Index.
Direxion Daily Nat Gas Related Bull 3X Shares **(GASL)**	Direxion Daily Natural Gas Related Bull 3X Shares is an exchange-traded fund incorporated in the USA. The Fund's objective is daily investment results of 300% of the performance of the ISE Revere Natural Gas Index.
Direxion Daily Nat Gas Related Bear 3X Shares **(GASX)**	Direxion Daily Natural Gas Related Bear 3X Shares is an exchange-traded fund incorporated in the USA. The Fund's objective is daily investment results of 300% the inverse (opposite) of the performance of the ISE Revere Natural Gas Index.

ProShares Short Oil & Gas **(DDG)**	Short Oil & Gas ProShares is an exchange-traded fund incorporated in the USA. The Fund seeks investment results that correspond to the inverse (opposite) of the daily performance of its underlying index.
MLPs-based ETFs	
JPMorgan Alerian MLP Index ETN **(AMJ)**	The JPMorgan Alerian MLP Index ETN is an exchange-traded note issued in the USA by JPMorgan Chase & Co. The Notes will provide investors with a cash payment at the scheduled maturity or upon early repurchase and pass on quarterly variable coupon payments to investors, based on the performance of the Alerian MLP Index.
ETRACS Alerian MLP Index ETN **(AMU)**	ETRACS Alerian MLP Index ETN is an exchange-traded note issued in the USA. The ETN will provide investors with a cash payment at the scheduled maturity or early redemption based on the performance of the Alerian MLP Index and may pay a quarterly coupon during the term. The Index measures the performance of 50 prominent energy master limited partnerships.
ETRACS Alerian Natural Gas MLP Index ETN **(MLPG)**	ETRACS Alerian Natural Gas MLP Index ETN is an exchange-traded note issued in the USA. The Notes will provide investors with a cash payment at the scheduled maturity or early redemption based on the performance of the underlying index, the Alerian Natural Gas MLP Index.
ETRACS Alerian MLP Infrastructure Index ETN **(MLPI)**	ETRACS Alerian MLP Infrastructure Index ETN is an exchange-traded note issued in the USA. The Notes will provide investors with a cash payment at the scheduled maturity or early redemption based on the performance of the underlying index, the Alerian MLP Infrastructure Index.
Alerian MLP ETF **(AMLP)**	Alerian MLP ETF is an exchange-traded fund incorporated in the USA. The Fund seeks to track the price and yield performance of the Alerian MLP Infrastructure Index.
Alerian Energy Infrastructure ETF **(ENFR)**	Alerian Energy Infrastructure ETF is an exchange-traded fund incorporated in the USA. The ETF tracks the performance of the Alerian Infrastructure Index, which is comprised of 30 equity securities of issuers headquartered or incorporated in the United States and Canada that engage in the transportation, storage, and processing of energy commodities ("midstream energy businesses").

Yorkville High Income MLP **(YMLP)**	Yorkville High Income MLP is an exchange-traded fund incorporated in the USA. The Fund seeks to track the performance of the Solactive High Income MLP Index.
Yorkville High Income Infrastructure MLP ETF **(YMLI)**	The Yorkville High Income Infrastructure MLP ETF is an exchange-traded fund incorporated in the USA. The Fund seeks to track the performance of the Solactive High Infrastructure MLP Index.
Global X MLP & Energy Infrastructure ETF **(MLPX)**	Global X MLP & Energy Infrastructure ETF is an exchange-traded fund incorporated in the USA. The ETF seeks to provide investment results that correspond generally to the price and yield performance, before fees and expenses, of the Solactive MLP & Energy Infrastructure Index.
Global X MLP ETF **(MLPA)**	Global X MLP ETF is an exchange-traded fund incorporated in the USA. The Fund seeks to track the performance of the Solactive MLP Composite Index.
Global X Junior MLP ETF **(MLPJ)**	The Global X Junior MLP ETF is an exchange-traded fund incorporated in the USA. The Fund seeks to provide investment results that correspond generally to the price and yield performance, before fees and expenses, of the Solactive Junior MLP Index.
Credit Suisse MLP Equal Weight Index ETN **(MLPN)**	Credit Suisse MLP Equal Weight Index ETN is an exchange-traded note issued in the USA. The ETN is designed to provide investors with exposure to the MLP equity sector via an equal-weighted index methodology as represented by the Cushing 30 MLP Index. The ETN pays a variable quarterly coupon linked to the cash distributions paid on the constituent MLPs in the Index.
Morgan Stanley Cushing MLP High Income Index ETN **(MLPY)**	The Morgan Stanley Cushing MLP High Income Index ETN is an exchange-traded note issued by Morgan Stanley. The Notes will provide investors with a cash payment at the scheduled maturity or early repurchase and variable coupon payments each quarter, in each case based on the performance of the underlying index, the Cushing MLP High Income Index.

iPath S&P MLP ETN **(IMLP)**	iPath S&P MLP ETN is an exchange-traded note incorporated in the USA. The Note will provide investors with a cash payment at the scheduled maturity or early redemption based on the performance of the underlying index S&P MLP Index.
Barclays ETN + Select MLP ETNs **(ATMP)**	Barclays ETN+ Select MLP ETN is an exchange-traded note incorporated in the USA. The Note will provide investors with a cash payment at the scheduled maturity or early redemption based on the performance of the underlying index Atlantic Trust Select MLP Index.
C-Tracks ETNs on Perform. of M/H MLP Fundamental Index **(MLPC)**	C-Tracks ETNs based on Performance of the Miller/Howard MLP Fundamental Index is an exchange-traded note issued in the USA. The Notes will provide investors with a cash payment at the scheduled maturity or early redemption based on the performance of the underlying index, the Miller/Howard MLP Fundamental Index.
ETRACS Wells Fargo MLP Index ETN **(MLPW)**	ETRACS Wells Fargo MLP Index ETN is an exchange-traded note issued in the USA. The Note will provide investors with a cash payment at the scheduled maturity or early redemption based on the performance of the underlying index, the Wells Fargo MLP Index.
First Trust N.American Energy Infrastructure Fund **(EMLP)**	First Trust North American Energy Infrastructure Fund is an exchange-traded fund incorporated in the USA. The fund will invest in publicly-traded master limited partnerships ("MLPs"), MLP affiliates, Canadian income trusts, pipeline companies, utilities, and other companies that derive at least 50% of their revenues from infrastructure assets such as pipelines.

Annex 6

ETFs Profiles

Symbol	Fund Family	Appropriations	Primary Benchmark	Symbol
UNG	United States Commodity Funds LLC	Derivatives Based	*S&P 500 Index*	SPX
UNL	United States Commodity Funds LLC	Derivatives Based	*S&P 500 Index*	SPX
NAGS	Teucrium	Derivatives Based	*Teucrium Natural Gas Fund*	TNAGS
DCNG	Barclays Funds	Derivatives Based	*Barclays Natural Gas Seasonal*	BCC2NGST
UGAZ	Credit Suisse AG	3x Leveraged, Derivatives Based	*S&P GSCI Natural Gas ER*	SPGSNGP
DGAZ	Credit Suisse AG	-3x Leveraged, Derivatives Based	*S&P GSCI Natural Gas ER*	SPGSNGP
GAZ	Barclays Funds	Derivatives Based	*DJ-UBS Natural Gas TR*	DJUBNGTR
BOIL	ProShares	2x Leveraged, Derivatives Based	*DJ-UBS Natural Gas*	DJUBSNG
KOLD	ProShares	-2x Leveraged, Derivatives Based	*DJ-UBS Natural Gas*	DJUBSNG
Symbol	Fund Family	Appropriations	Primary Benchmark	Symbol
FRAK	Market Vectors	Full Replication Strategy, Unknown Securities Lending	*MarketVectors Global Unc. Oil&Gas TR*	MVFRAKTR
FCG	First Trust	Full Replication Strategy	*ISE-REVERE Natural Gas Index*	FUM
GASL	Direxion Funds	3x Leveraged, Swap & Derivatives Based, Derivative Replication Strategy	*ISE-REVERE Natural Gas Index*	FUM
GASX	Direxion Funds	-3x Leveraged, Swap & Derivatives Based, Derivative Replication Strategy	*ISE-REVERE Natural Gas Index*	FUM
DDG	ProShares	-1x Leveraged, Swap & Derivatives Based, Derivative Replication Strategy	*DJ-US Oil & Gas*	DJUSEN

Symbol	Fund Family	Appropriations	Primary Benchmark	Symbol
AMJ	JPMorgan	Derivatives Based, Derivative Replication Strategy	*Alerian MLP Index*	**AMZ**
AMU	UBS AG	Derivatives Based, Derivative Replication Strategy	*Alerian MLP Index*	**AMZ**
MLPG	UBS AG	Derivatives Based, Derivative Replication Strategy	*Alerian Natural Gas MLP*	**ANGI**
MLPI	UBS AG	Derivatives Based, Derivative Replication Strategy	*Alerian MLP Infrastructure*	**AMZI**
AMLP	ALPS	Full Replication Strategy	*Alerian MLP Infrastructure*	**AMZI**
ENFR	ALPS	Full Replication Strategy	*Alerian Energy Infrastructure*	**AMEI**
YMLP	Exchange Traded Concepts LLC	Optimized Replication Strategy, Securities Lending	*Solactive High Income MLP Index*	**YMLP**
YMLI	Exchange Traded Concepts LLC	Optimized Replication Strategy	*Solactive High Infrastructure MLP Index*	**YMLI**
MLPX	Global X Funds	Full Replication Strategy	*Solactive MLP Energy Infrastructure Index*	**SOLMLPX**
MLPA	Global X Funds	Full Replication Strategy	*Solactive MLP Composite Index*	**SOLMLPA**
MLPJ	Global X Funds	Full Replication Strategy	*Solactive Junior MLP Index*	**SOLMLPJ**
MLPN	Credit Suisse AG	Derivatives Based, Derivative Replication Strategy	*Cushing 30 MLP Index*	**MLPX**
MLPY	Morgan Stanley	No Replication Strategy	*Cushing MLP High Income Index*	**MLPY**
IMLP	Barclays Funds	Derivatives Based, Derivative Replication Strategy	*S&P MLP Index*	**SPMLP**
ATMP	Barclays Funds	Derivative Replication Strategy, Securities Lending	*Atlantic Trust Select MLP Index*	**BXIIATMP**
MLPC	Citigroup	Derivatives Based, No Replication Strategy	*S&P 500 Index*	**SPX**
MLPW	UBS AG	Derivatives Based, Derivative Replication Strategy	*Wells Fargo MLP Index*	**WML**
EMLP	First Trust	Actively Managed, No Replication Stragegy	*S&P 500 Index*	**SPX**

Annex 7

ETFs Fundamentals

Exchange	NYSE Arca	
Currency	USD	28-02-2014

Symbol	Inception Date	Close	Price 52-Week Range	NAV	Volume	30D Avg Volume	Assets	Market Capitalization	Shares Out	% Premium	% Premium Avg 52w	Expense Ratio	Bid Ask Spread
UNG	18-04-2007	25,51	16,60 - 27,89	25,52	17,71 M	3,4 M	871,85 M	871,59 M	34,17 M	-0,03	0,04	0,60	0,02
UNL	18-11-2009	20,19	15,67 - 21,22	20,26	19,59 m	7,1 m	22,28 M	22,21 M	1,10 M	-0,33	-0,06	0,75	0,02
NAGS	01-02-2011	13,61	8,28 - 14,42	13,61	398	424	2,04 M	2,04 M	150 m	0,03	-0,24	1,50	0,47
DCNG	20-04-2011	31,40	25,60 - 34,73	31,51	276	178	7,71 M	7,68 M	240 m	-0,34	-0,13	0,85	0,06
UGAZ	07-02-2012	27,17	11,92 - 42,73	27,27	1,88 M	376,2 m	53,24 M	91,70 M	3,38 M	-0,38	0,10	1,65	0,05
DGAZ	07-02-2012	3,42	2,74 - 20,52	3,43	21,47 M	2,5 M	242,70 M	379,16 M	110,87 M	-0,15	-0,13	1,65	0,01
GAZ	23-10-2007	3,06	2,06 - 3,58	3,06	229,71 m	66,2 m	36,59 M	36,59 M	11,96 M	-0,04	2,12	0,75	0,04
BOIL	06-10-2011	49,10	26,84 - 64,36	49,35	119,35 m	78,5 m	28,12 M	27,98 M	570 m	-0,50	0,05	0,95	0,20
KOLD	06-10-2011	41,70	34,00 - 110,45	41,55	178,52 m	60,4 m	88,29 M	88,61 M	2,12 M	0,36	-0,06	0,95	0,22
Symbol	Inception Date	Close	Price 52-Week Range	NAV	Volume	30D Avg Volume	Assets	Market Capitalization	Shares Out	% Premium	% Premium Avg 52w	Expense Ratio	Bid Ask Spread
FRAK	15-02-2012	29,14	23,32 - 30,66	29,17	9,59 m	3,5 m	47,90 M	50,99 M	1,75 M	-0,10	0,29	0,54	0,08
FCG	11-05-2007	19,84	15,27 - 20,62	19,85	1,29 M	170,3 m	468,37 M	468,22 M	23,60 M	-0,03	-0,01	0,60	0,01
GASL	14-07-2010	34,85	17,52 - 41,02	34,83	45,69 m	23,3 m	16,60 M	13,94 M	400 m	0,05	-0,08	0,95	0,11
GASX	14-07-2010	22,94	20,63 - 65,60	22,90	22,53 m	13,2 m	5,28 M	9,46 M	410 m	0,17	-0,06	0,95	0,07
DDG	12-06-2008	24,79	24,09 - 30,64	24,83	246	223	1,86 M	1,86 M	80 m	-0,16	-0,45	0,95	0,54
Symbol	Inception Date	Close	Price 52-Week Range	NAV	Volume	30D Avg Volume	Assets	Market Capitalization	Shares Out	% Premium	% Premium Avg 52w	Expense Ratio	Bid Ask Spread
AMJ	01-04-2009	45,84	42,18 - 49,31	46,68	503,11 m	121,4 m	5,91 B	5,80 B	126,50 M	-1,24	1,19	0,85	0,02
AMU	17-07-2012	28,94	26,26 - 30,13	n.a.	47,99 m	3,3 m	215,47 M	227,00 M	7,84 M	n.a.	n.a.	0,80	0,06
MLPG	13-07-2010	35,88	31,37 - 52,99	n.a.	2,51 m	491	32,70 M	32,30 M	900 m	n.a.	n.a.	0,85	0,31
MLPI	31-03-2010	39,01	35,69 - 40,50	n.a.	356,32 m	32,8 m	1,63 B	1,70 B	43,56 M	n.a.	n.a.	0,85	0,08
AMLP	25-08-2010	17,41	16,75 - 18,36	17,41	3,90 M	387,1 m	7,66 B	7,61 B	436,86 M	0,02	0,05	0,85	0,02
ENFR	01-11-2013	26,10	24,32 - 26,54	26,05	1,61 m	3,7m	3,86 M	5,22 M	200 m	0,20	0,20	0,65	0,05
YMLP	13-03-2012	18,16	17,68 -19,35	18,13	73,89 m	9,1 m	261,27 M	266,04 M	14,65 M	0,17	0,23	0,82	0,07
YMLI	12-02-2013	21,07	19,67 - 21,80	21,01	7,13 m	1,1 m	33,62 M	33,71 M	1,60 M	0,29	0,16	0,82	0,08

Symbol	Inception Date	Close	Price 52-Week Range	NAV	Volume	30D Avg Volume	Assets	Market Capitalization	Shares Out	% Premium	% Premium Avg 52w	Expense Ratio	Bid Ask Spread
MLPX	07-08-2013	16,65	14,43 - 16,91	16,61	9,01 m	2,4 m	29,07 M	29,14 M	1,75 M	0,24	0,15	0,45	0,05
MLPA	19-04-2012	15,91	15,31 - 16,70	15,87	20,47 m	4,2 m	76,99 M	75,57 M	4,75 M	0,25	0,11	0,45	0,02
MLPJ	15-01-2013	16,28	15,11 - 16,41	16,25	1,67 m	1,0 m	14,62 M	14,65 M	900 m	0,18	0,07	0,75	0,06
MLPN	13-04-2010	31,47	26,98 - 33,13	*n.a.*	123,25 m	10,9 m	689,51 M	702,34 M	22,32 M	*n.a.*	*n.a.*	0,85	0,04
MLPY	17-03-2011	17,60	16,16 - 18,90	*n.a.*	9,90 m	2,5 m	48,69 M	47,19 M	2,68 M	*n.a.*	*n.a.*	0,85	0,04
IMLP	03-01-2013	29,22	26,22 - 31,23	29,22	2,26 m	1,7 m	57,37 M	57,38 M	1,96 M	0,02	0,16	0,80	0,03
ATMP	12-03-2013	27,19	24,16 - 29,25	27,17	14,99 m	4,4 m	189,11 M	189,25 M	6,96 M	0,08	0,16	0,95	0,03
MLPC	25-09-2013	26,44	24,77 - 27,14	*n.a.*	1,45 m	2,7 m	26,09 M	26,44 M	1,00 M	*n.a.*	*n.a.*	0,95	0,03
MLPW	29-10-2010	33,83	30,47 - 34,46	*n.a.*	91	16	13,47 M	13,53 M	400 m	*n.a.*	*n.a.*	0,85	0,29
EMLP	21-06-2012	23,94	21,60 - 24,53	23,91	150,03 m	11,8 m	468,70 M	469,34 M	19,61 M	0,14	0,13	0,95	0,03

Dividends

Symbol	Type	Frequency	Last Div Net	Yield
UNG	*Not reported*	*Not reported*	*Not reported*	*Not reported*
UNL	*Not reported*	*Not reported*	*Not reported*	*Not reported*
NAGS	*Not reported*	*Not reported*	*Not reported*	*Not reported*
DCNG	*Not reported*	*Not reported*	*Not reported*	*Not reported*
UGAZ	*Not reported*	*Not reported*	*Not reported*	*Not reported*
DGAZ	*Not reported*	*Not reported*	*Not reported*	*Not reported*
GAZ	*Not reported*	*Not reported*	*Not reported*	*Not reported*
BOIL	*Not reported*	*Not reported*	*Not reported*	*Not reported*
KOLD	*Not reported*	*Not reported*	*Not reported*	*Not reported*

Symbol	Type	Frequency	Last Div Net	Yield
FRAK	Income	Irregular	0,14	0,49%
FCG	Income	Quarter	0,00	0,34%
GASL	Discontinued	Irregular	*n.a.*	*n.a.*
GASX	Discontinued	Irregular	*n.a.*	*n.a.*
DDG	Discontinued	Irregular	*n.a.*	*n.a.*

Symbol	Type	Frequency	Last Div Net	Yield
AMJ	Income	Quarter	0,57	4,89%
AMU	Income	Quarter	0,36	4,91%
MLPG	Income	Quarter	0,45	4,99%
MLPI	Income	Quarter	0,46	4,63%
AMLP	Income	Quarter	0,28	6,23%
ENFR	Income	Quarter	0,07	0,25%
YMLP	Income	Quarter	0,41	9,04%
YMLI	Income	Quarter	0,33	6,25%
MLPX	Income	Quarter	0,09	1,20%
MLPA	Income	Quarter	0,22	5,62%

Symbol	Type	Frequency	Last Div Net	Yield
MLPJ	Income	Quarter	0,25	6,31%
MLPN	Income	Quarter	0,33	4,27%
MLPY	Income	Quarter	0,33	7,67%
IMLP	Income	Quarter	0,33	4,55%
ATMP	Income	Quarter	0,27	3,89%
MLPC	Income	Quarter	0,30	1,14%
MLPW	Income	Quarter	0,39	4,55%
EMLP	Income	Quarter	0,21	3,24%

Annex 8

Absolute and Active Returns

Symbol	ETF Return	ETF Return 1y	ETF Return 6m	Benchmark Return	Benchmark Return 1y	Benchmark Return 6m	Excess Return	Excess Return 1y	Excess Return 6m
UNG	-11,8%	14,0%	27,9%	2,2%	8,4%	10,4%	-14,0%	5,6%	17,5%
UNL	-6,6%	6,9%	13,4%	5,4%	8,4%	10,4%	-11,9%	-1,5%	3,0%
NAGS	-6,8%	6,9%	16,5%	-4,7%	8,2%	18,9%	-2,1%	-1,4%	-2,3%
DCNG	-2,6%	4,9%	13,8%	-1,6%	5,4%	14,7%	-1,0%	-0,5%	-1,0%
UGAZ	15,4%	32,1%	66,0%	6,6%	12,2%	24,0%	8,7%	19,9%	42,1%
DGAZ	-24,4%	-41,3%	-79,0%	6,8%	12,2%	24,0%	-31,2%	-53,5%	-102,9%
GAZ	-13,0%	10,9%	23,1%	-12,3%	10,4%	21,2%	-0,8%	0,4%	1,9%
BOIL	-11,1%	18,7%	39,3%	-4,6%	10,4%	21,2%	-6,5%	8,3%	18,1%
KOLD	7,5%	-22,9%	-45,5%	-4,7%	10,4%	21,2%	12,2%	-33,3%	-66,7%
Symbol	ETF Return	ETF Return 1y	ETF Return 6m	Benchmark Return	Benchmark Return 1y	Benchmark Return 6m	Excess Return	Excess Return 1y	Excess Return 6m
FRAK	3,2%	7,6%	5,3%	3,5%	7,7%	6,2%	-0,3%	-0,2%	-0,9%
FCG	3,0%	9,1%	10,7%	3,0%	9,2%	10,7%	-0,01%	-0,1%	-0,1%
GASL	8,7%	28,1%	32,7%	3,7%	9,2%	10,7%	5,0%	18,9%	22,0%
GASX	-11,4%	-30,1%	-34,2%	3,9%	9,2%	10,7%	-15,2%	-39,3%	-44,9%
DDG	-4,3%	-4,4%	-2,8%	1,5%	4,1%	2,1%	-5,8%	-8,5%	-4,9%
Symbol	ETF Return	ETF Return 1y	ETF Return 6m	Benchmark Return	Benchmark Return 1y	Benchmark Return 6m	Excess Return	Excess Return 1y	Excess Return 6m
AMJ	7,4%	3,1%	0,8%	7,3%	2,8%	3,2%	0,1%	0,3%	-2,4%
AMU	4,0%	2,9%	3,3%	3,8%	2,8%	3,2%	0,1%	0,1%	0,03%
MLPG	4,4%	4,9%	2,6%	4,1%	4,6%	2,5%	0,4%	0,3%	0,1%
MLPI	4,9%	3,1%	1,4%	4,7%	3,2%	1,5%	0,2%	-0,1%	-0,04%
AMLP	2,0%	1,0%	-0,2%	4,7%	3,2%	1,5%	-2,8%	-2,2%	-1,6%
ENFR	5,3%	5,3%	5,3%	4,7%	4,7%	4,7%	0,7%	0,7%	0,7%

Symbol	ETF Return	ETF Return 1y	ETF Return 6m	Benchmark Return	Benchmark Return 1y	Benchmark Return 6m	Excess Return	Excess Return 1y	Excess Return 6m
YMLP	-1,8%	-0,5%	0,1%	0,2%	1,6%	2,9%	-2,0%	-2,2%	-2,7%
YMLI	2,0%	2,2%	1,7%	4,7%	5,2%	4,2%	-2,7%	-3,0%	-2,5%
MLPX	8,0%	8,0%	**10,1%**	9,0%	9,0%	**11,1%**	-1,0%	-1,0%	-1,0%
MLPA	6,7%	6,7%	6,7%	29,6%	29,6%	29,6%	-22,9%	-22,9%	-22,9%
MLPJ	2,2%	2,0%	3,9%	8,6%	7,3%	9,7%	-6,4%	-5,3%	-5,8%
MLPN	5,1%	6,5%	6,6%	5,1%	6,3%	6,8%	-0,02%	0,2%	-0,2%
MLPY	0,7%	1,1%	1,6%	0,2%	1,0%	1,7%	0,5%	0,1%	-0,1%
IMLP	5,4%	3,3%	2,8%	5,4%	3,8%	3,8%	-0,1%	-0,5%	-0,9%
ATMP	4,1%	4,1%	4,5%	4,0%	4,0%	4,3%	0,1%	0,1%	0,2%
MLPC	4,5%	4,5%	4,5%	8,7%	8,7%	8,7%	-4,1%	-4,1%	-4,1%
MLPW	6,5%	6,2%	2,1%	5,8%	6,3%	1,9%	0,7%	-0,1%	0,1%
EMLP	4,7%	2,7%	3,1%	8,3%	8,4%	**10,4%**	-3,6%	-5,7%	-7,4%

Annex 9

Risk-Adjusted Returns

Symbol	Sharpe Ratio	Sharpe Ratio 1y	Sharpe Ratio 6m	Treynor Ratio	Treynor Ratio 1y	Treynor Ratio 6m	Information Ratio	Information Ratio 1y	Information Ratio 6m	Sortino Ratio	Sortino Ratio 1y	Sortino Ratio 6m
UNG	-0,050	0,024	0,065	-0,675	0,270	0,844	-0,046	0,022	0,060	-0,064	0,034	0,095
UNL	-0,069	-0,010	0,020	-1,372	-0,175	0,339	-0,061	-0,009	0,017	-0,082	-0,013	0,026
NAGS	-0,011	-0,008	-0,014	-0,024	-0,015	-0,026	-0,021	-0,014	-0,022	-0,029	-0,020	-0,031
DCNG	-0,006	-0,003	-0,007	-0,012	-0,006	-0,011	-0,011	-0,005	-0,008	-0,015	-0,007	-0,012
UGAZ	0,012	0,029	0,054	0,032	0,073	0,154	0,018	0,045	0,082	0,027	0,068	0,127
DGAZ	-0,042	-0,079	-0,132	0,114	0,196	0,376	-0,031	-0,059	-0,097	-0,042	-0,077	-0,124
GAZ	-0,003	0,002	0,006	-0,009	0,005	0,022	-0,004	0,004	0,017	-0,006	0,006	0,024
BOIL	-0,013	0,019	0,037	-0,035	0,045	0,098	-0,026	0,038	0,074	-0,039	0,057	0,112
KOLD	0,025	-0,076	-0,134	-0,066	0,182	0,364	0,017	-0,050	-0,088	0,023	-0,065	-0,111

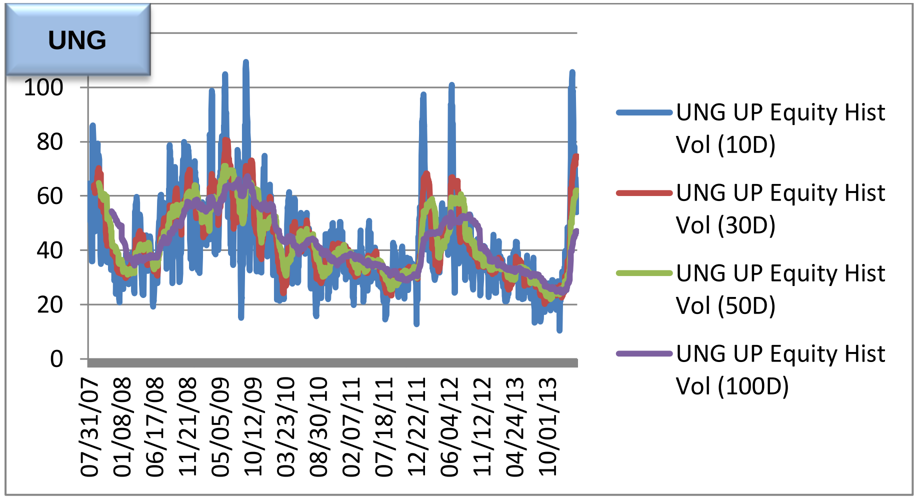
Symbol	Sharpe Ratio	Sharpe Ratio 1y	Sharpe Ratio 6m	Treynor Ratio	Treynor Ratio 1y	Treynor Ratio 6m	Information Ratio	Information Ratio 1y	Information Ratio 6m	Sortino Ratio	Sortino Ratio 1y	Sortino Ratio 6m
FRAK	-0,002	-0,002	-0,008	-0,003	-0,002	-0,009	-0,005	-0,005	-0,028	-0,008	-0,007	-0,037
FCG	-0,00004	-0,0005	-0,0004	-0,0001	-0,001	-0,001	-0,0002	-0,005	-0,006	-0,0003	-0,007	-0,009
GASL	0,011	0,046	0,058	0,021	0,077	0,090	0,017	0,070	0,086	0,025	0,100	0,130
GASX	-0,034	-0,097	-0,118	0,063	0,164	0,187	-0,024	-0,072	-0,088	-0,035	-0,101	-0,118
DDG	-0,027	-0,071	-0,038	0,069	0,102	0,059	-0,014	-0,042	-0,024	-0,020	-0,059	-0,034

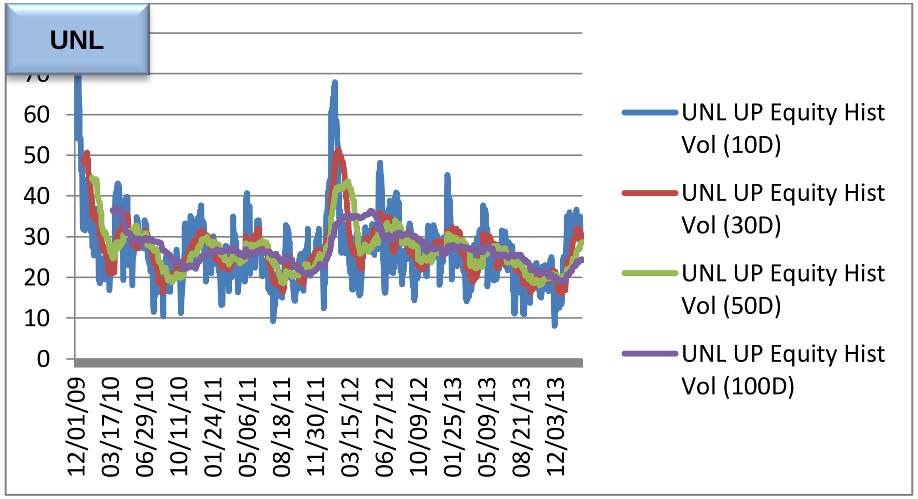
Symbol	Sharpe Ratio	Sharpe Ratio 1y	Sharpe Ratio 6m	Treynor Ratio	Treynor Ratio 1y	Treynor Ratio 6m	Information Ratio	Information Ratio 1y	Information Ratio 6m	Sortino Ratio	Sortino Ratio 1y	Sortino Ratio 6m
AMJ	0,001	0,003	-0,030	0,001	0,003	-0,025	0,002	0,005	-0,072	0,003	0,007	-0,088
AMU	0,002	0,001	0,0003	0,001	0,001	0,0003	0,003	0,002	0,001	0,004	0,003	0,001
MLPG	0,003	0,003	0,001	0,004	0,004	0,001	0,006	0,008	0,003	0,008	0,011	0,003
MLPI	0,002	-0,001	-0,0005	0,002	-0,001	-0,0004	0,005	-0,002	-0,001	0,007	-0,003	-0,002
AMLP	-0,039	-0,035	-0,029	-0,039	-0,031	-0,023	-0,072	-0,057	-0,047	-0,090	-0,073	-0,056
ENFR	0,011	0,011	0,011	0,007	0,007	0,007	0,023	0,023	0,023	0,036	0,036	0,036

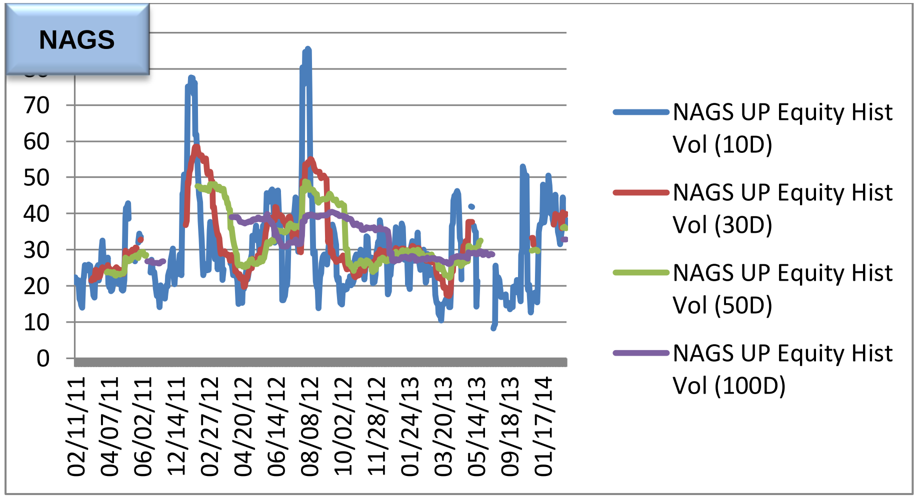
Symbol	Sharpe Ratio	Sharpe Ratio 1y	Sharpe Ratio 6m	Treynor Ratio	Treynor Ratio 1y	Treynor Ratio 6m	Information Ratio	Information Ratio 1y	Information Ratio 6m	Sortino Ratio	Sortino Ratio 1y	Sortino Ratio 6m
YMLP	-0,027	-0,040	**-0,055**	-0,026	-0,028	-0,035	-0,046	-0,048	-0,063	-0,058	-0,060	-0,077
YMLI	-0,044	-0,050	-0,044	-0,044	-0,050	-0,042	-0,058	-0,065	-0,056	-0,077	-0,085	-0,076
MLPX	-0,013	-0,013	-0,014	-0,010	-0,010	-0,010	-0,037	-0,037	-0,038	-0,050	-0,050	-0,051
MLPA	-0,141	-0,141	-0,141	-0,297	-0,297	-0,297	-0,305	-0,291	-0,291	-0,331	-0,331	-0,331
MLPJ	-0,109	-0,090	-0,107	-0,101	-0,084	-0,092	-0,143	-0,119	-0,131	-0,174	-0,149	-0,164
MLPN	-0,0002	0,002	-0,002	-0,0002	0,002	-0,002	-0,0004	0,005	-0,006	-0,001	0,007	-0,008
MLPY	0,004	0,001	-0,002	0,005	0,001	-0,002	0,009	0,001	-0,003	0,012	0,002	-0,004
IMLP	-0,001	-0,006	-0,012	-0,001	-0,005	-0,010	-0,001	-0,012	-0,027	-0,002	-0,016	-0,034
ATMP	0,001	0,001	0,002	0,001	0,001	0,002	0,002	0,002	0,003	0,003	0,003	0,004
MLPC	-0,062	-0,062	-0,062	-0,099	-0,099	-0,099	-0,057	-0,057	-0,057	-0,075	-0,075	-0,075
MLPW	0,007	-0,001	0,002	0,007	-0,001	0,002	0,014	-0,002	0,003	0,019	-0,003	0,004
EMLP	-0,055	-0,084	**-0,123**	-0,056	-0,088	**-0,114**	-0,069	-0,107	**-0,129**	-0,091	**-0,138**	**-0,162**

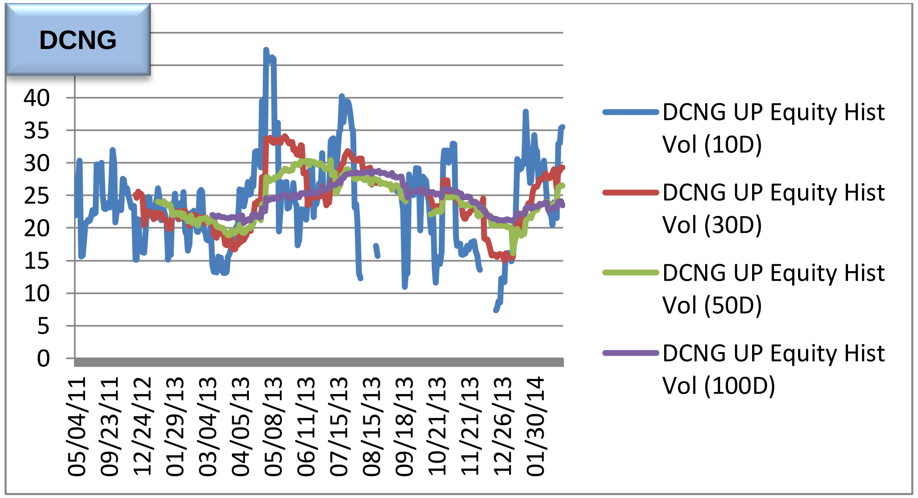
Annex 10

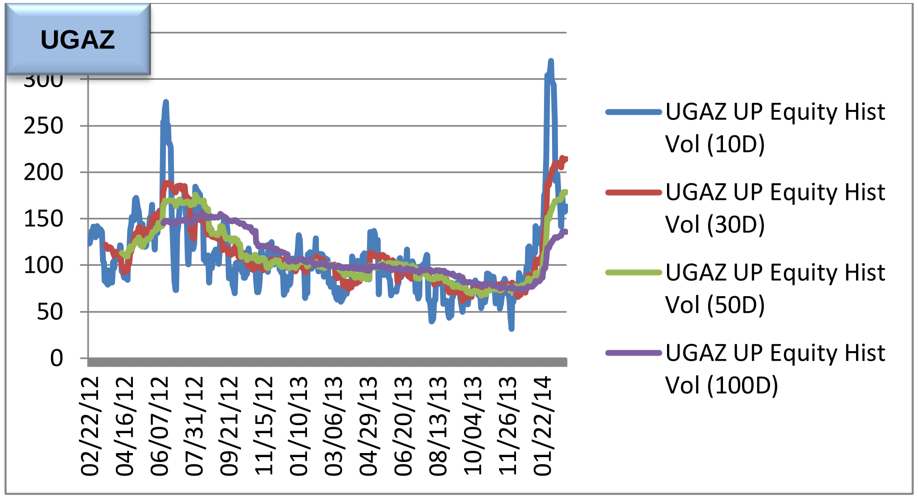
Historical Volatilities







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07/31/12
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03/06/13
04/29/13
06/20/13
08/13/13
10/04/13
11/26/13
01/22/14
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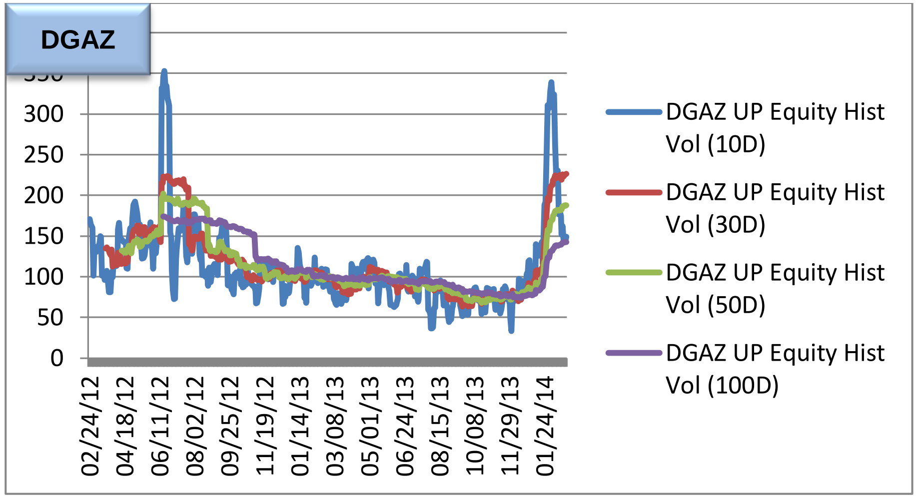
UGAZ UP Equity Hist Vol (30D)
UGAZ UP Equity Hist Vol (50D)
UGAZ UP Equity Hist Vol (100D)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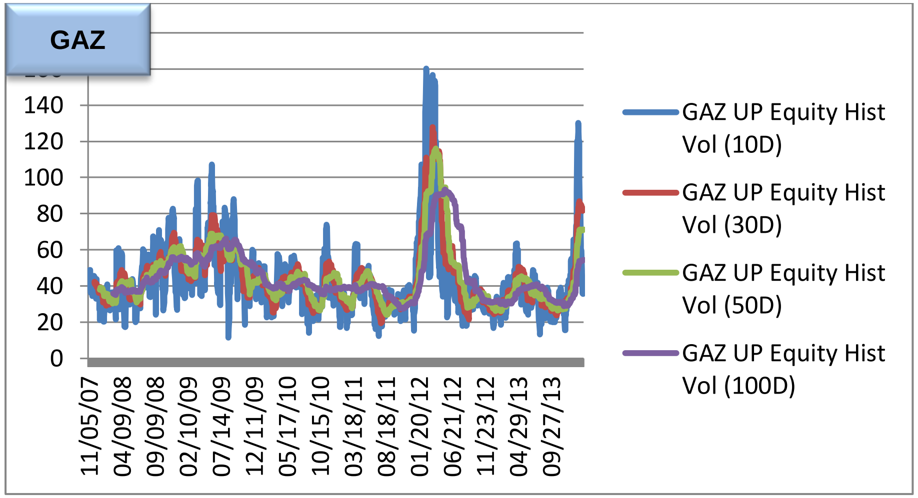
06/24/13
08/15/13
10/08/13
11/29/13
01/24/14
DGAZ UP Equity Hist Vol (10D)
DGAZ UP Equity Hist Vol (30D)
DGAZ UP Equity Hist Vol (50D)
DGAZ UP Equity Hist Vol (100D)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02/10/09
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01/20/12
06/21/12
11/23/12
04/29/13
09/27/13
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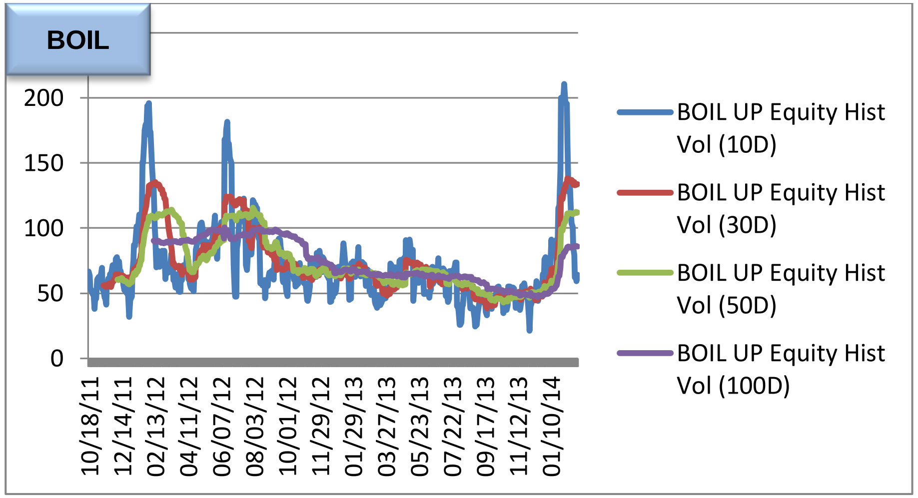
GAZ UP Equity Hist Vol (50D)
GAZ UP Equity Hist Vol (100D)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06/07/12
08/03/12
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03/27/13
05/23/13
07/22/13
09/17/13
11/12/13
01/10/14
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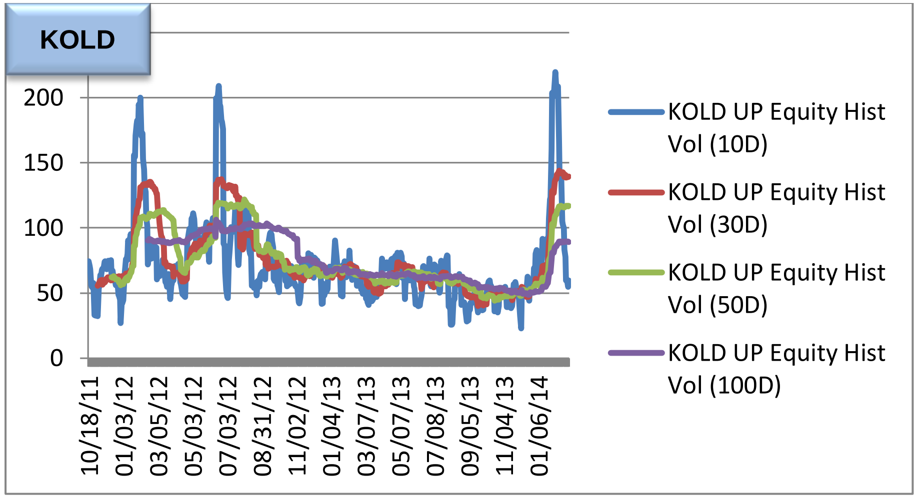
BOIL UP Equity Hist Vol (30D)
BOIL UP Equity Hist Vol (50D)
BOIL UP Equity Hist Vol (100D)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05/07/13
07/08/13
09/05/13
11/04/13
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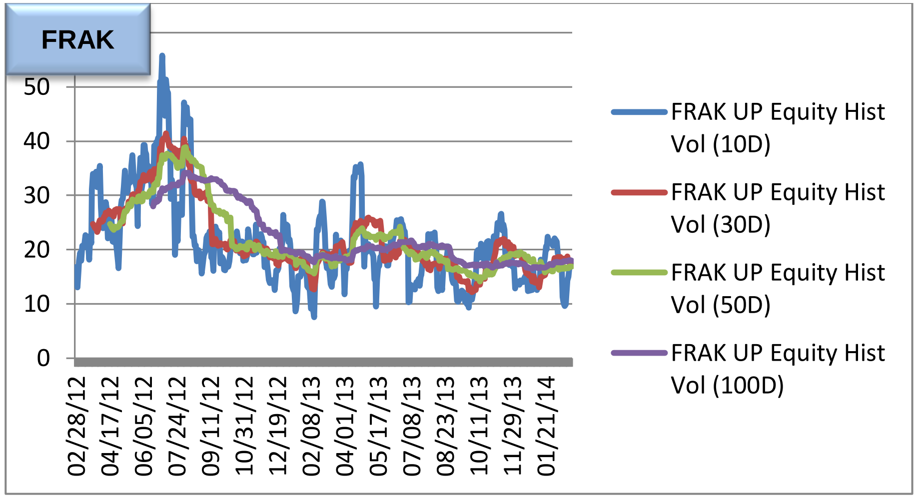
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07/08/13
08/23/13
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11/29/13
01/21/14
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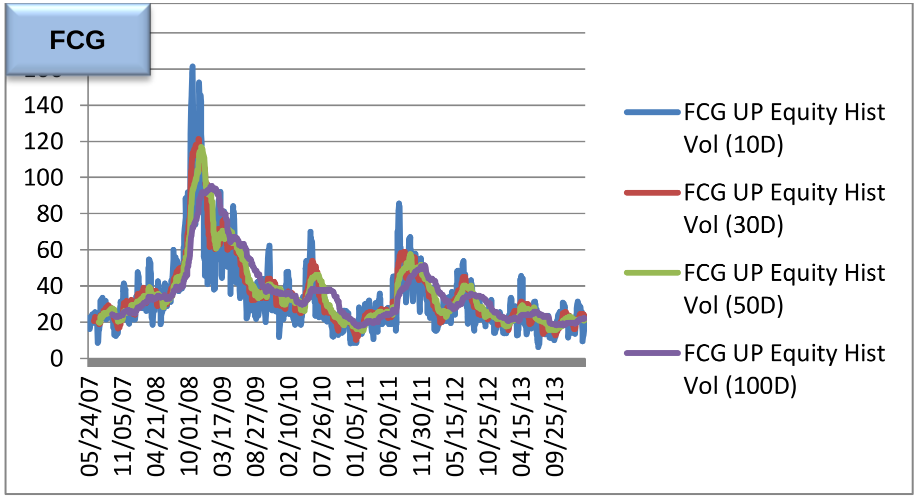
FRAK UP Equity Hist Vol (30D)
FRAK UP Equity Hist Vol (50D)
FRAK UP Equity Hist Vol (100D)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10/01/08
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08/27/09
02/10/10
07/26/10
01/05/11
06/20/11
11/30/11
05/15/12
10/25/12
04/15/13
09/25/13
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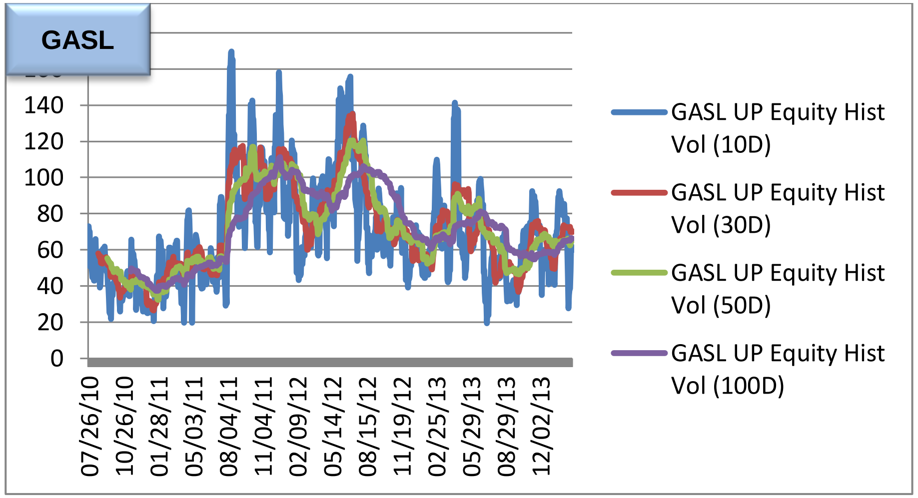
FCG UP Equity Hist Vol (30D)
FCG UP Equity Hist Vol (50D)
FCG UP Equity Hist Vol (100D)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05/29/13
08/29/13
12/02/13
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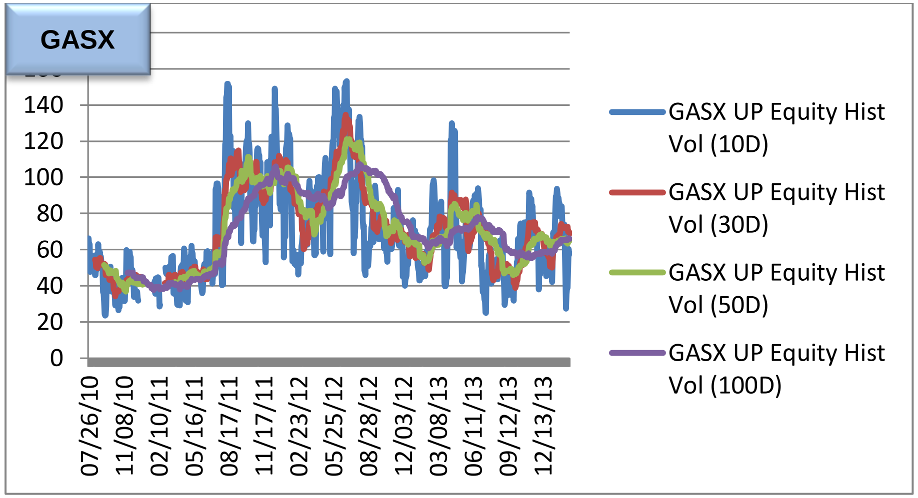
GASL UP Equity Hist Vol (30D)
GASL UP Equity Hist Vol (50D)
GASL UP Equity Hist Vol (100D)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12/13/13
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GASX UP Equity Hist Vol (30D)
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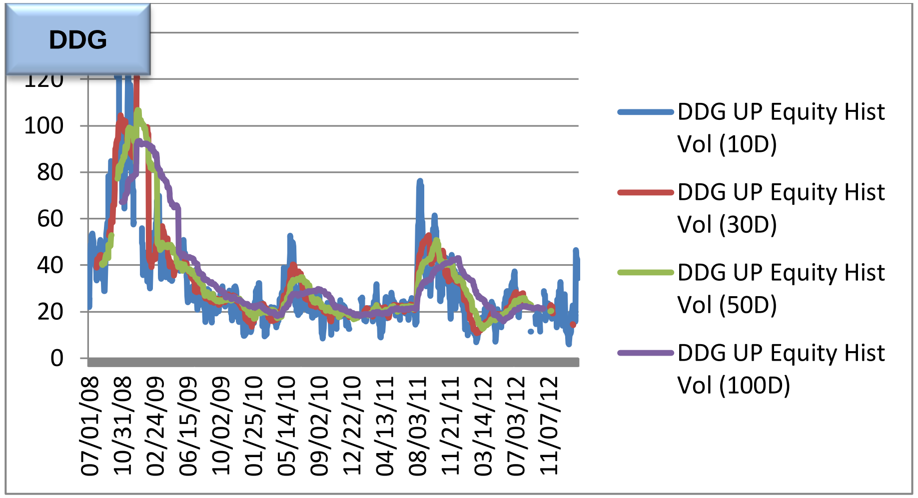
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08/03/11
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11/07/12
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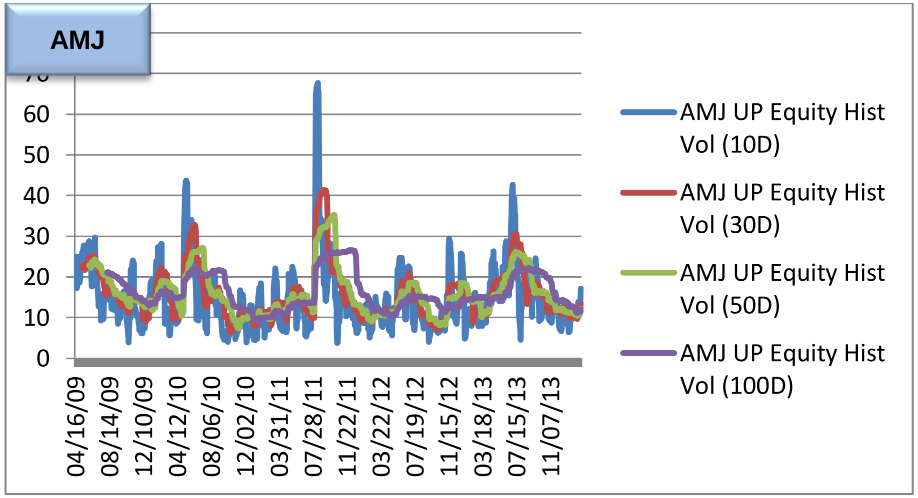
DDG UP Equity Hist Vol (30D)
DDG UP Equity Hist Vol (50D)
DDG UP Equity Hist Vol (100D)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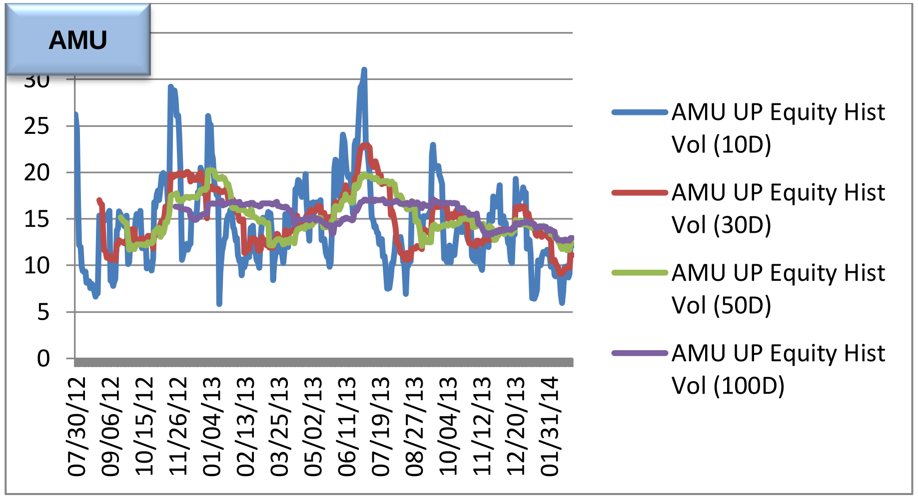
AMJ UP Equity Hist Vol (30D)
AMJ UP Equity Hist Vol (50D)
AMJ UP Equity Hist Vol (100D)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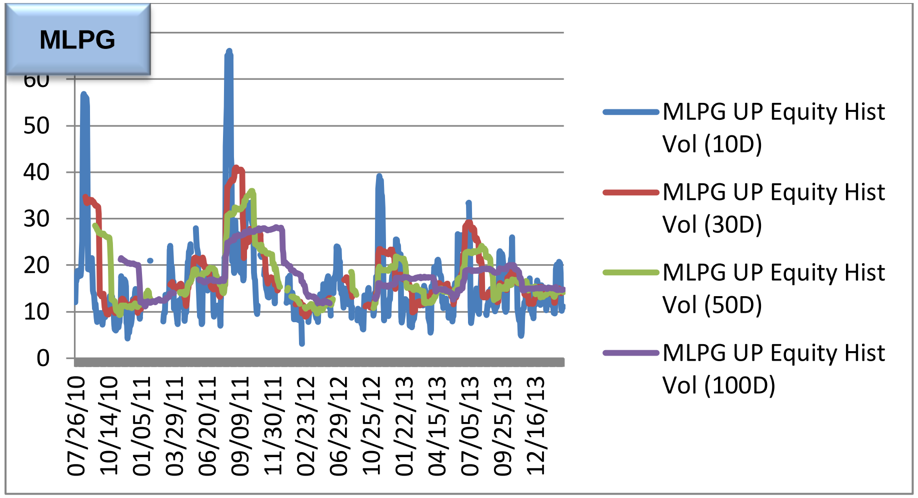
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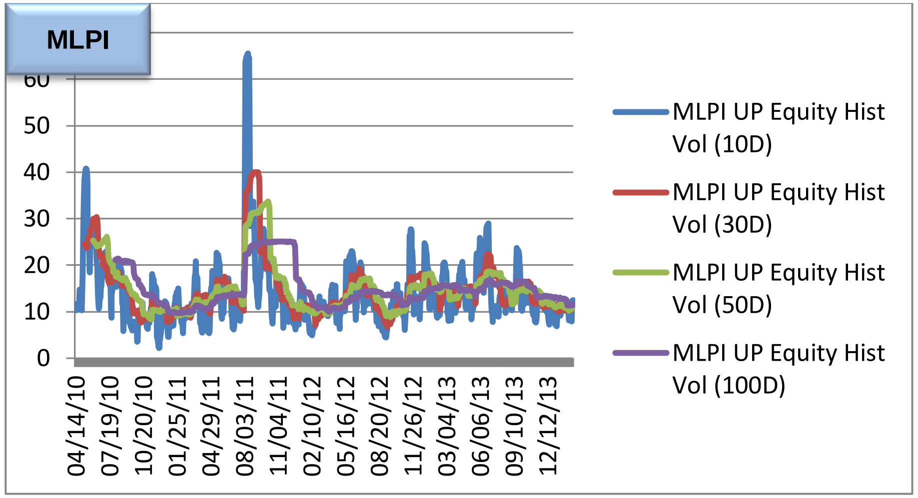
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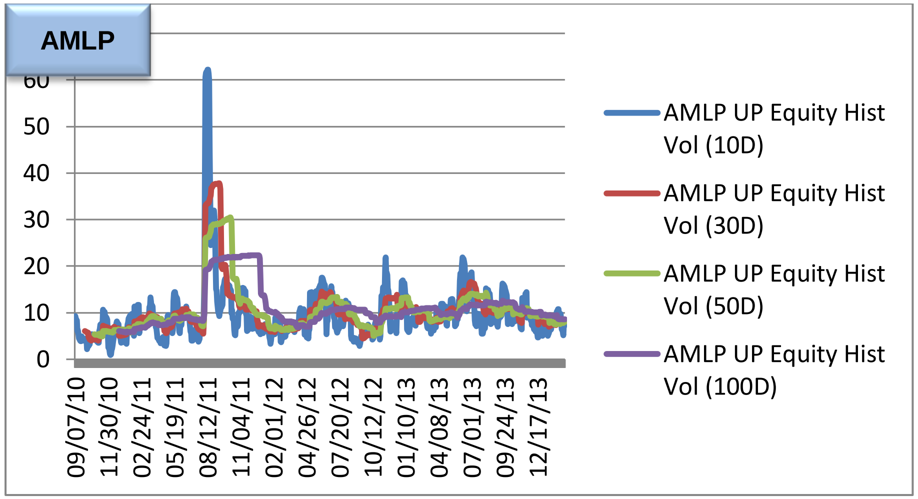
MLPI UP Equity Hist Vol (50D)
MLPI UP Equity Hist Vol (100D)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07/01/13
09/24/13
12/17/13
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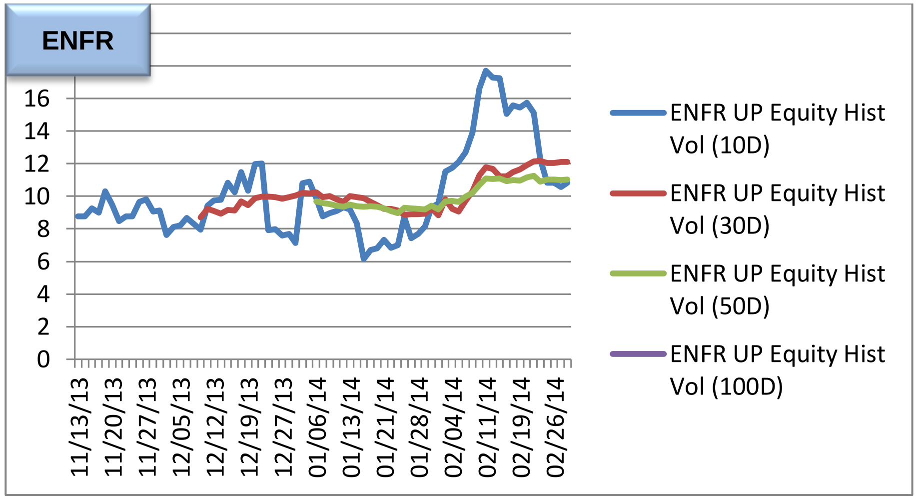
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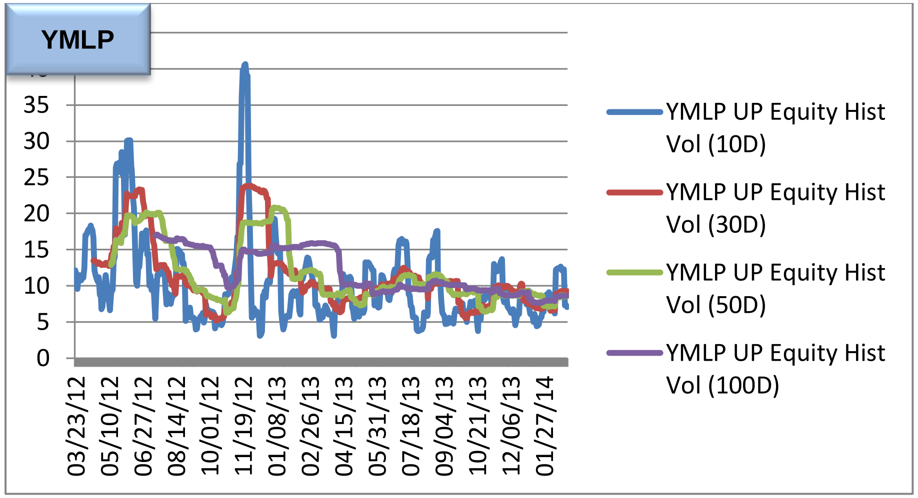
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10/21/13
12/06/13
01/27/14
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YMLP UP Equity Hist Vol (30D)
YMLP UP Equity Hist Vol (50D)
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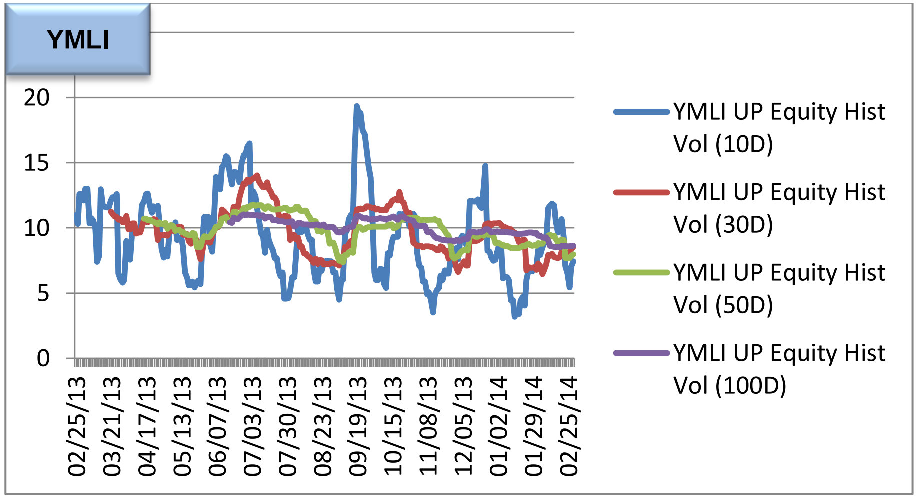
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11/08/13
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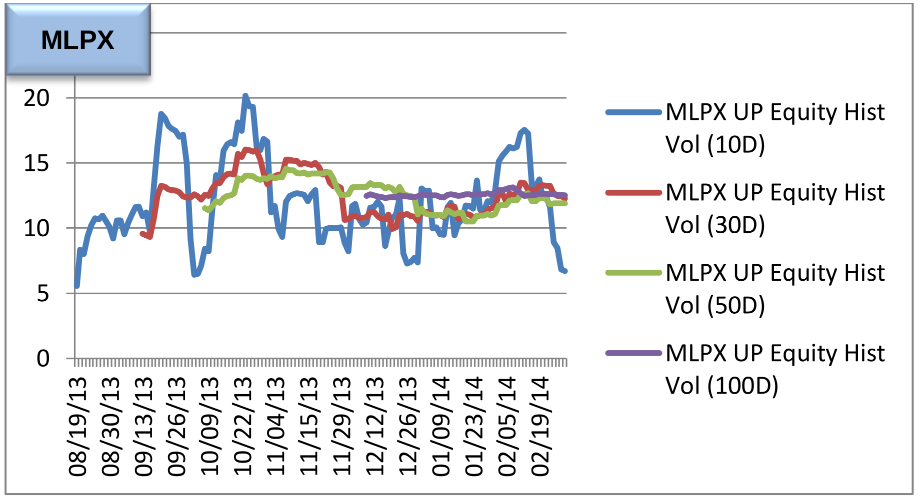
01/02/14
01/29/14
02/25/14
YMLI UP Equity Hist Vol (10D)
YMLI UP Equity Hist Vol (30D)
YMLI UP Equity Hist Vol (50D)
YMLI UP Equity Hist Vol (100D)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11/29/13
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12/26/13
01/09/14
01/23/14
02/05/14
02/19/14
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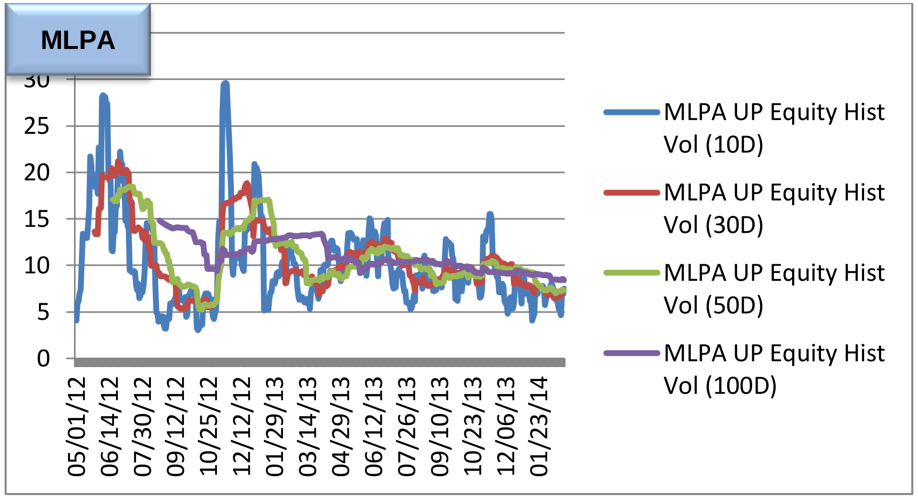
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09/10/13
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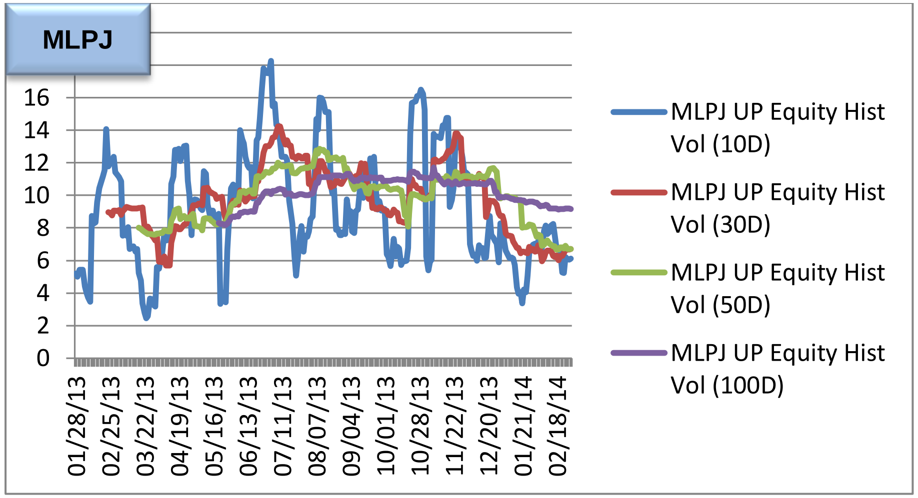
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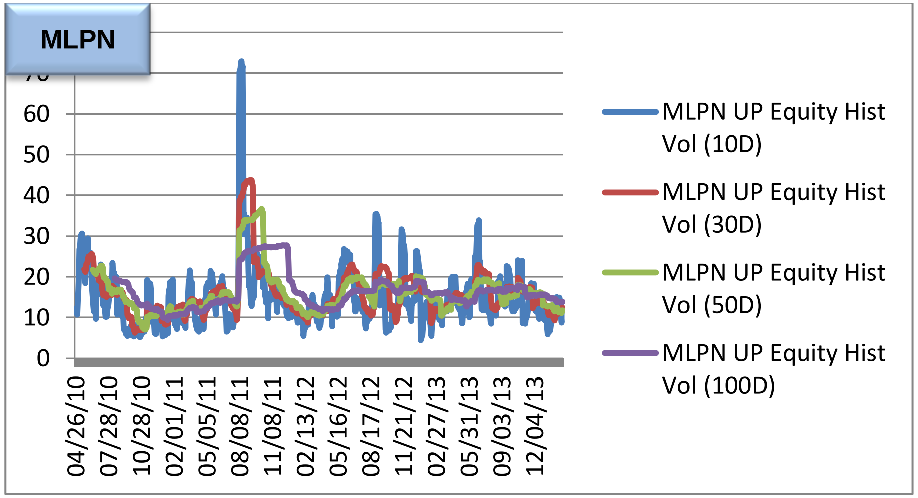
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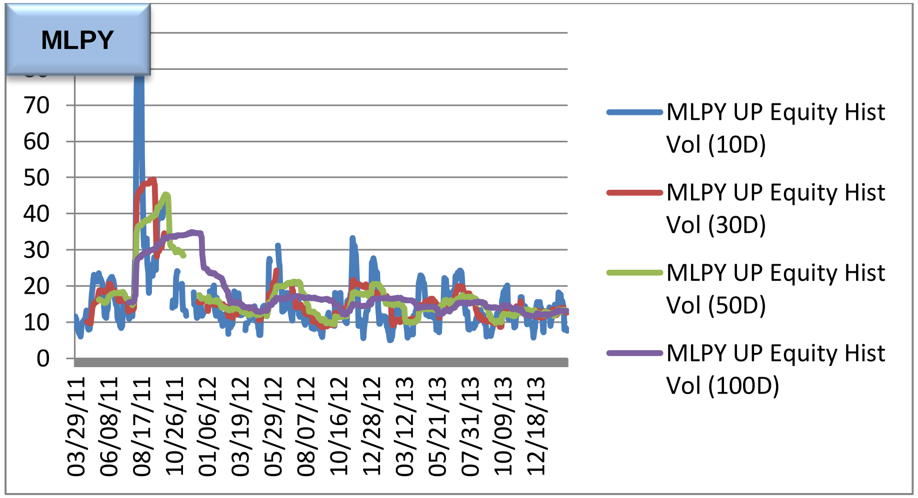
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10/09/13
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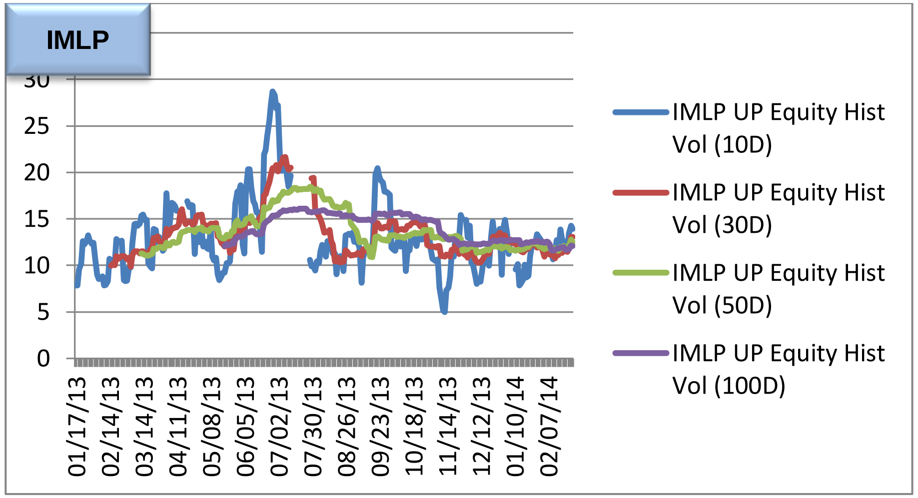
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08/26/13
09/23/13
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12/12/13
01/10/14
02/07/14
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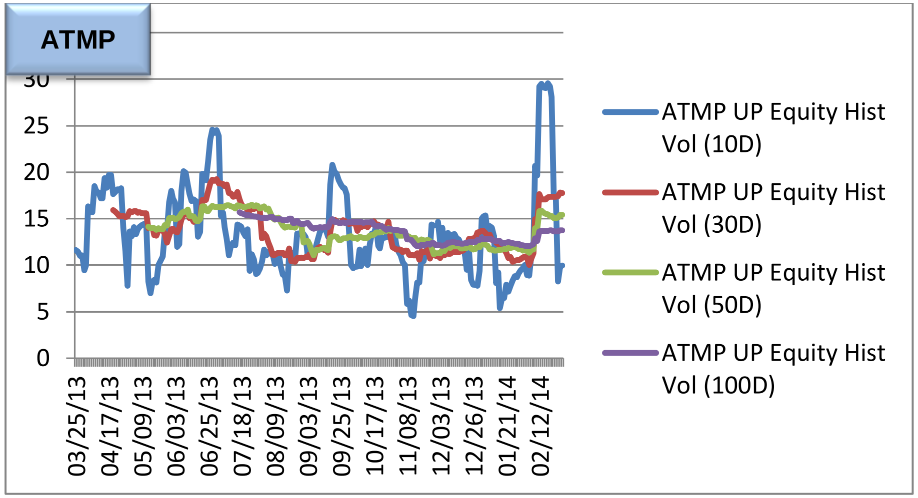
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09/25/13
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11/08/13
12/03/13
12/26/13
01/21/14
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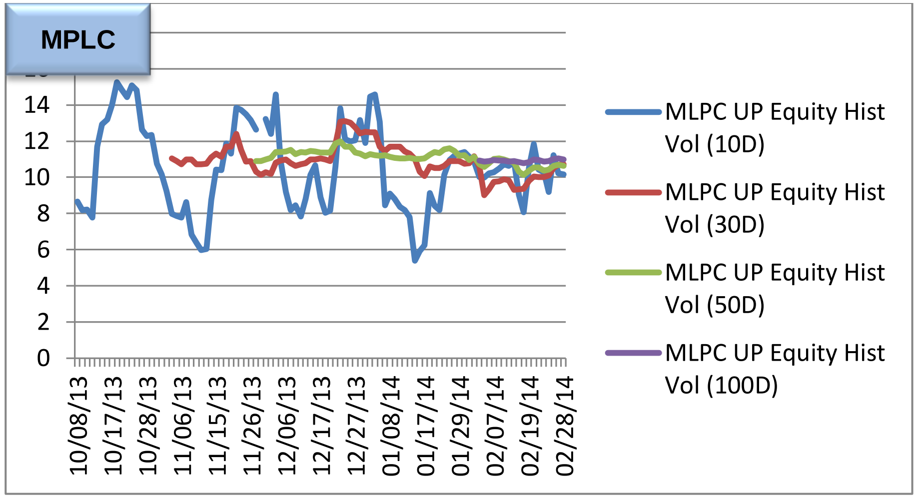
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02/07/14
02/19/14
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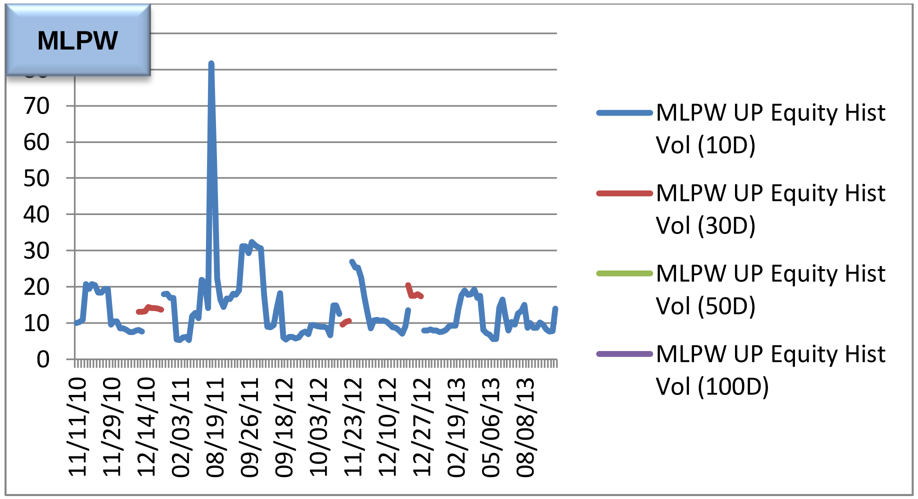
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02/19/13
05/06/13
08/08/13
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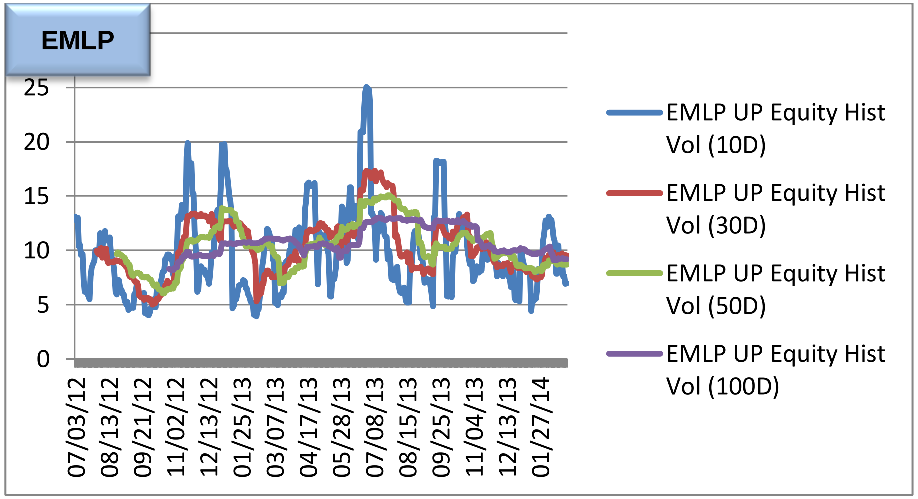
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11/04/13
12/13/13
01/27/14
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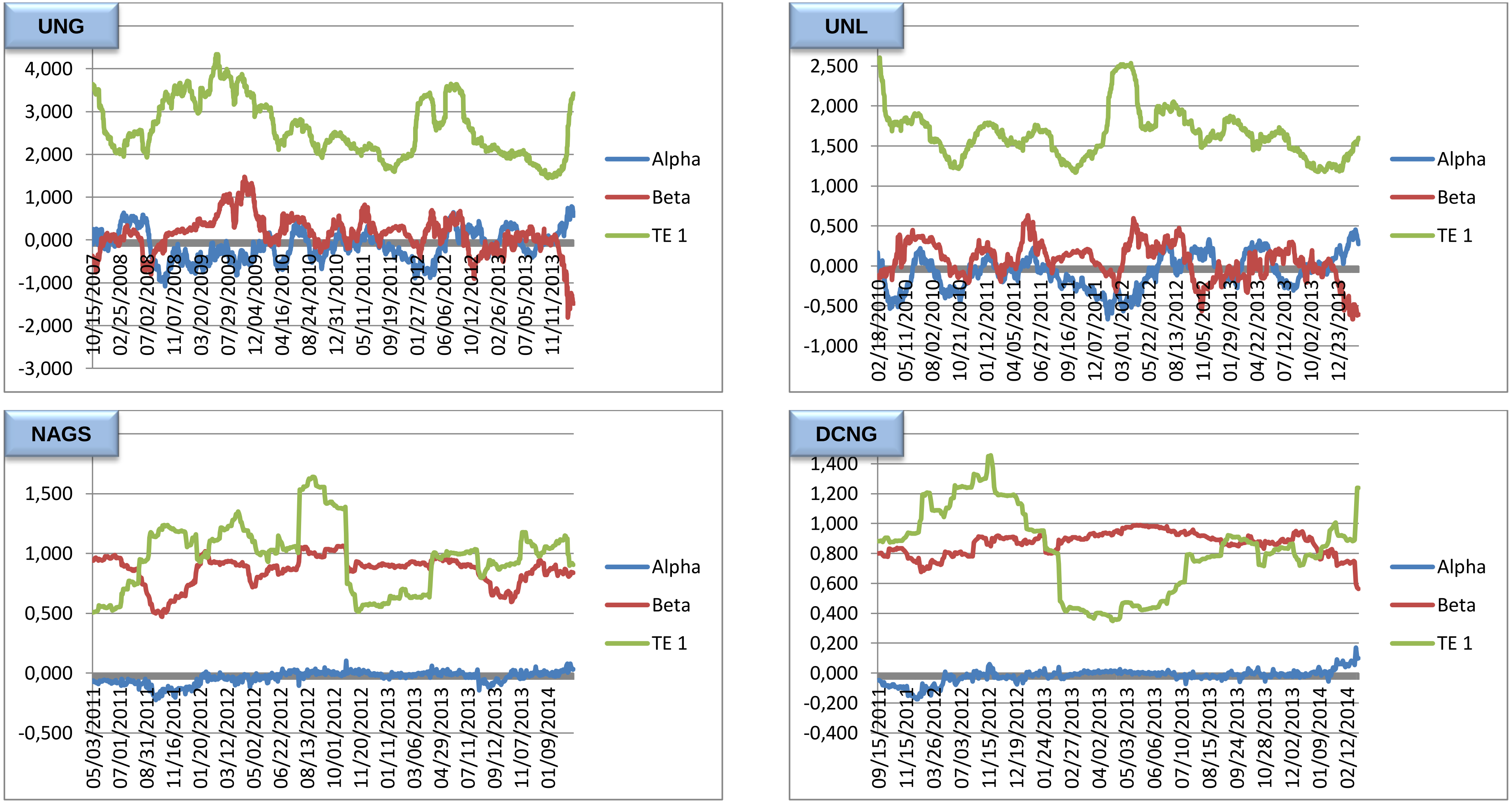
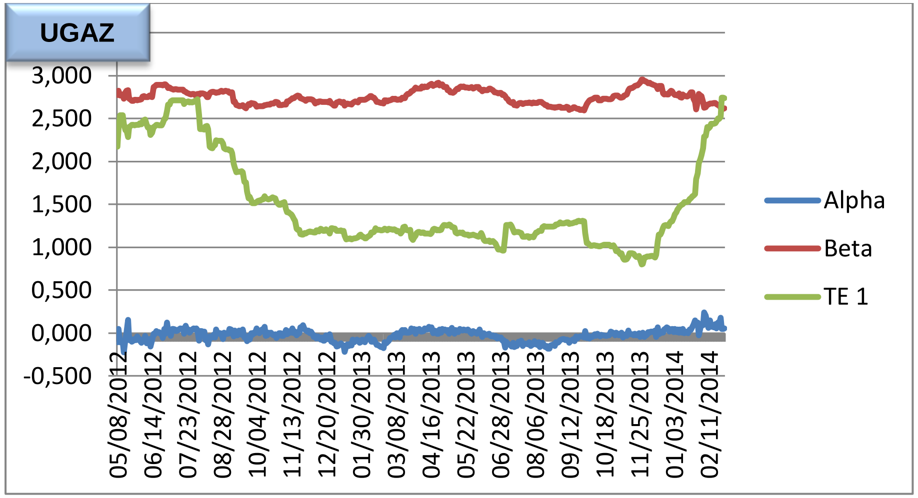
EMLP UP Equity Hist Vol (50D)
EMLP UP Equity Hist Vol (100D)

Annex 11

Time Consistency

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05/22/2013
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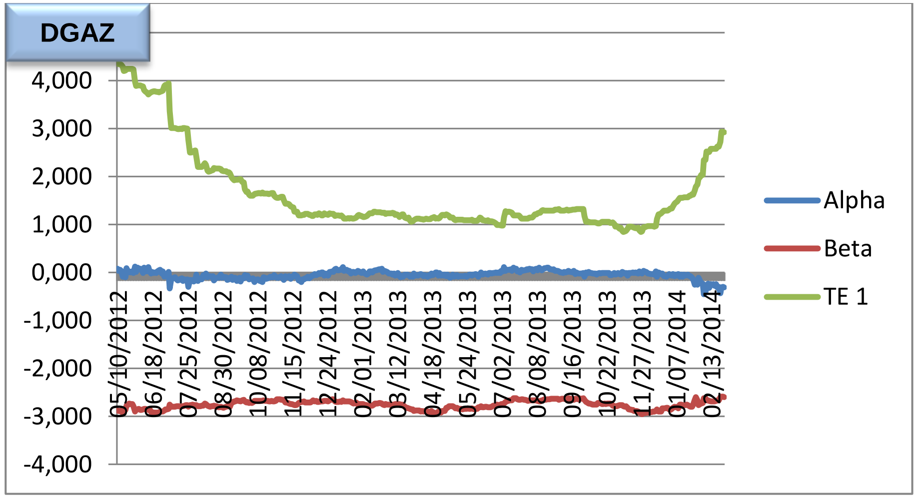
10/18/2013
11/25/2013
01/03/2014
02/11/2014
Alpha
Beta
TE 1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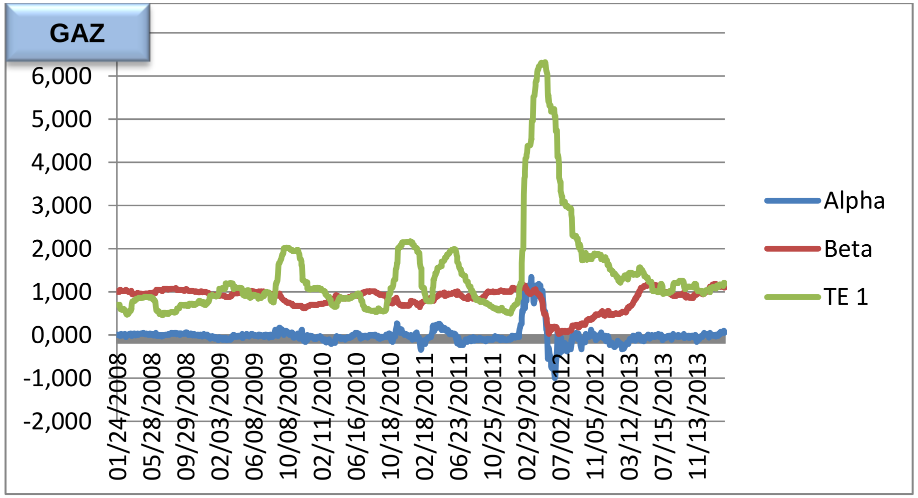
Alpha
Beta
TE 1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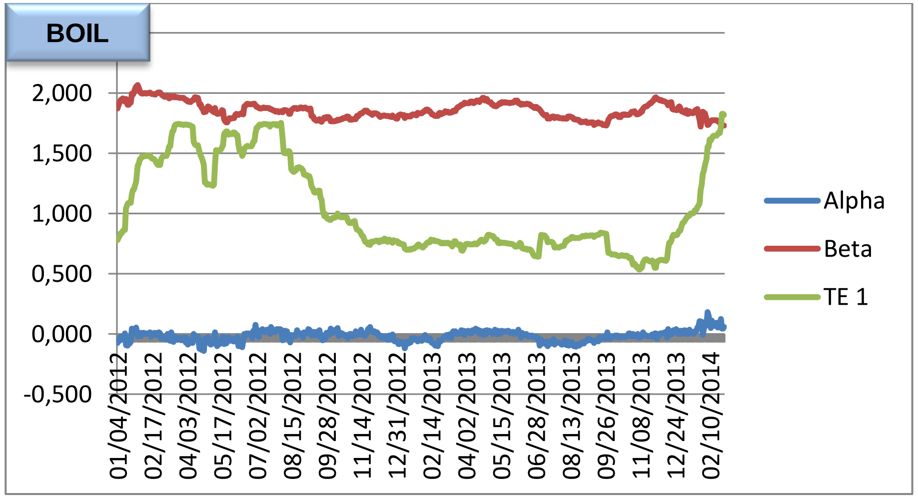
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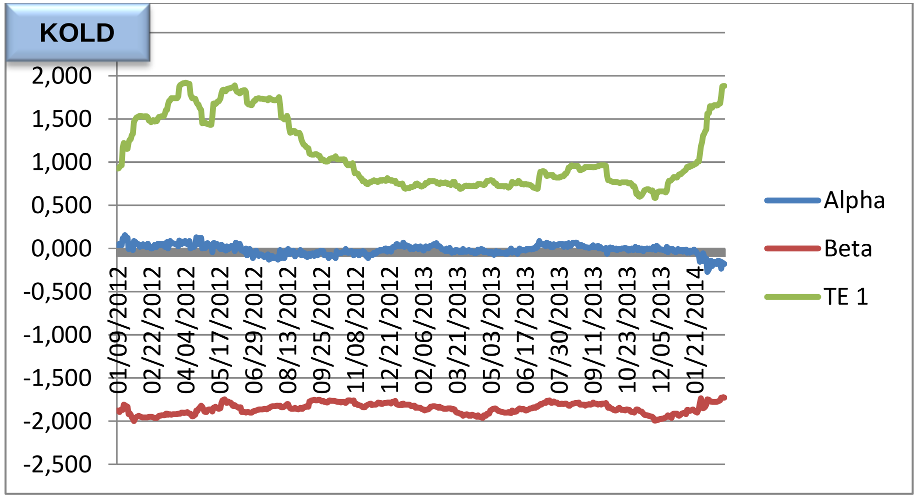
Alpha
Beta
TE 1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Alpha
Beta
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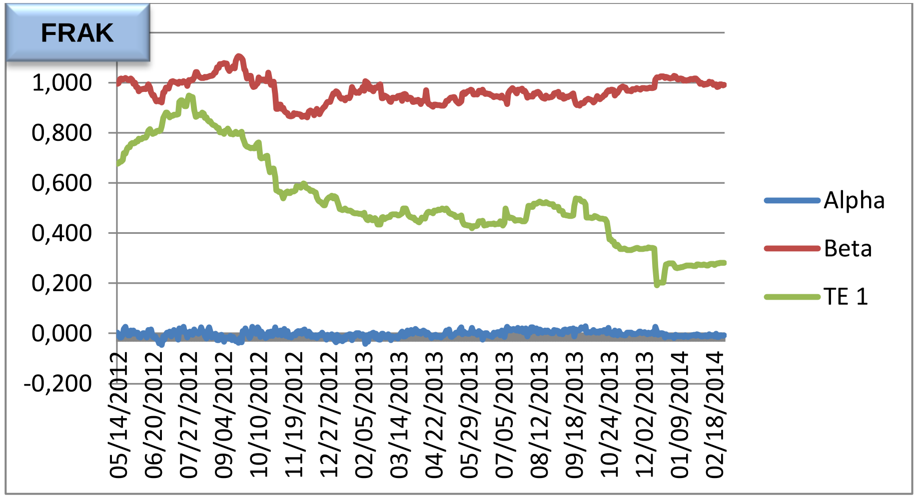
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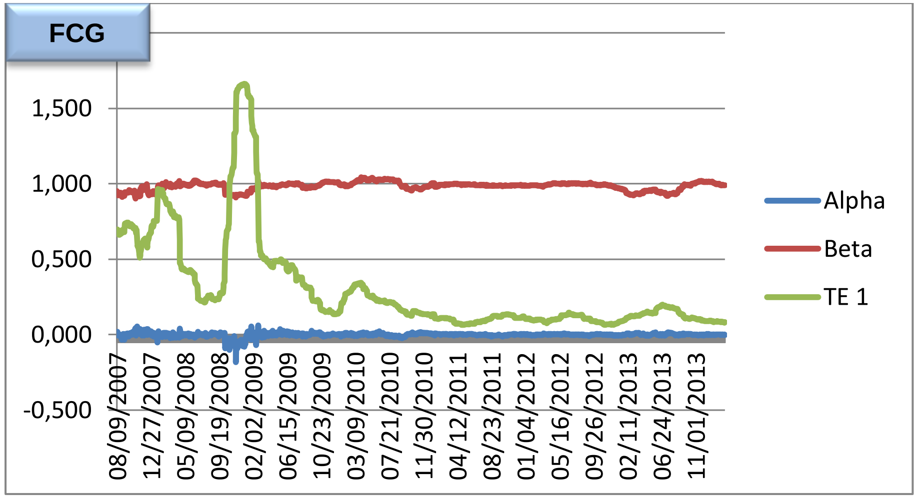
Alpha
Beta
TE 1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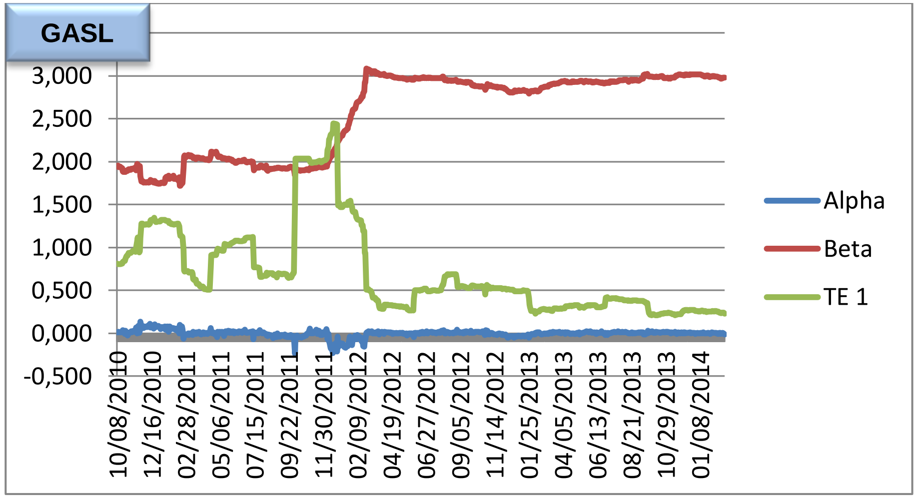
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Alpha
Beta
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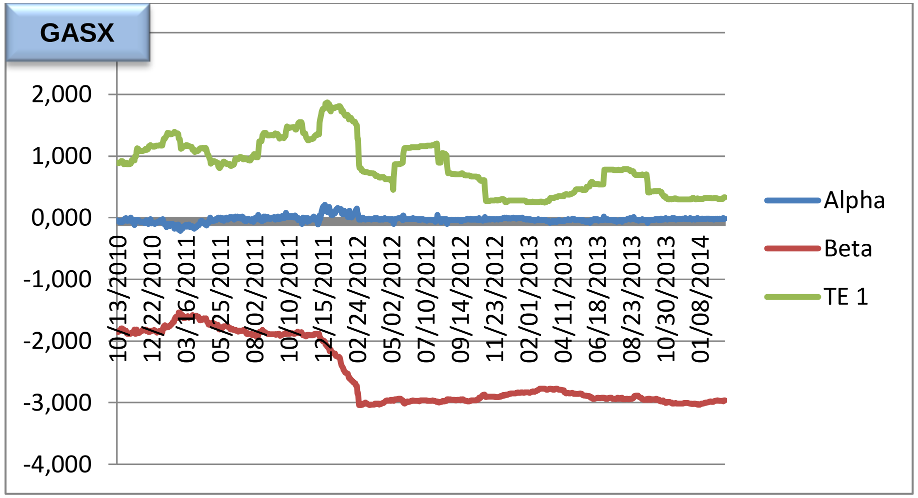
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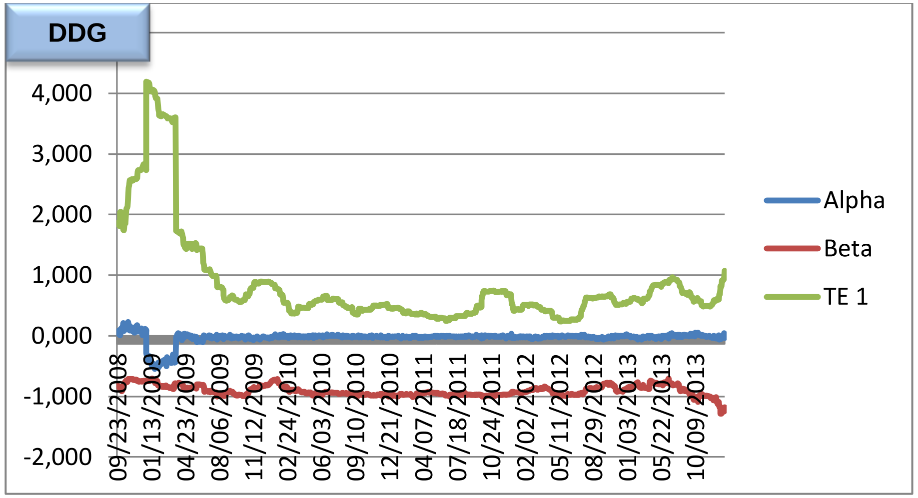
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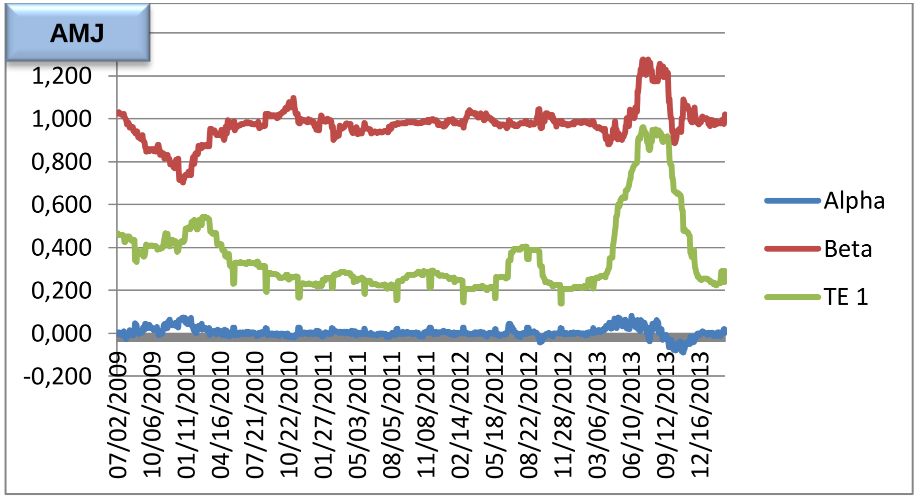
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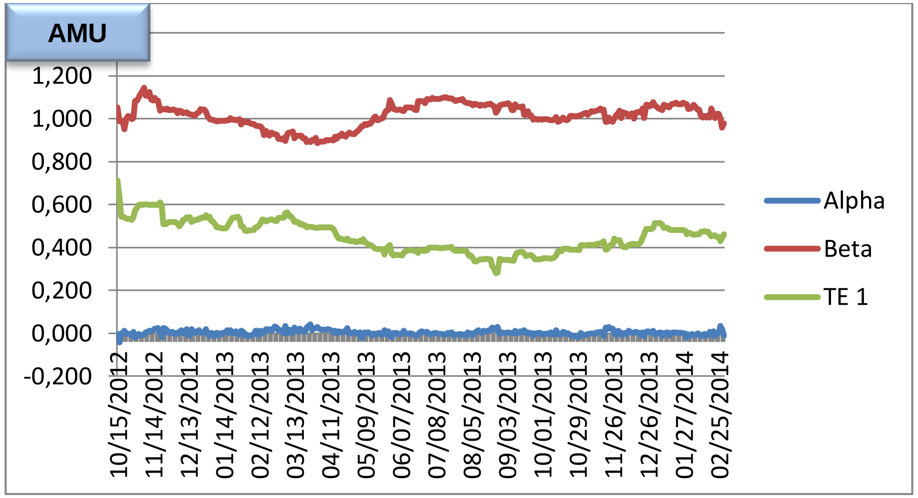
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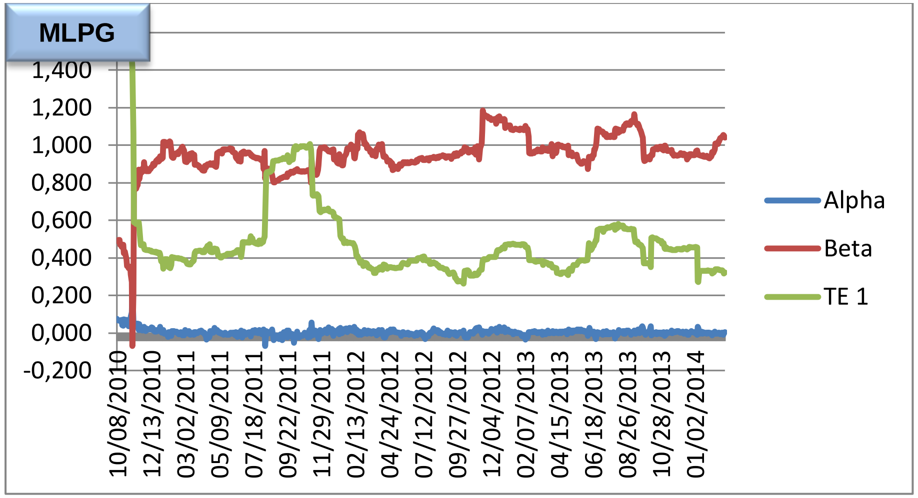
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Alpha
Beta
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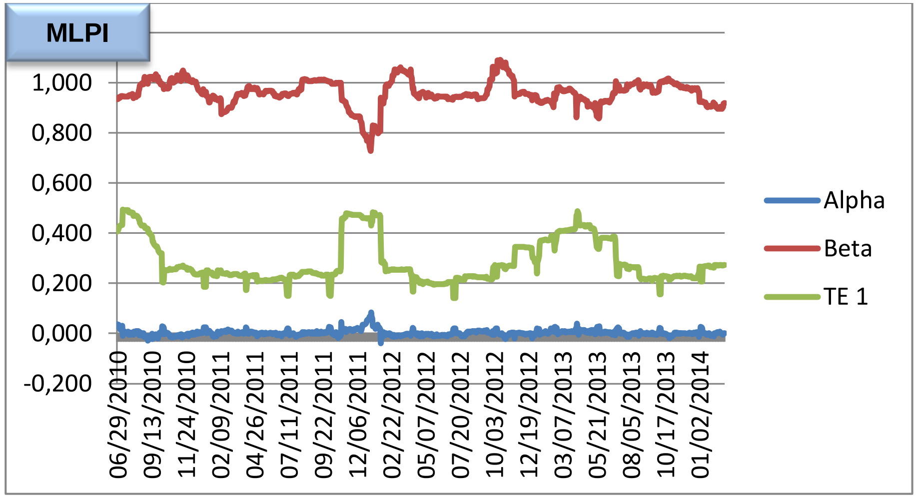
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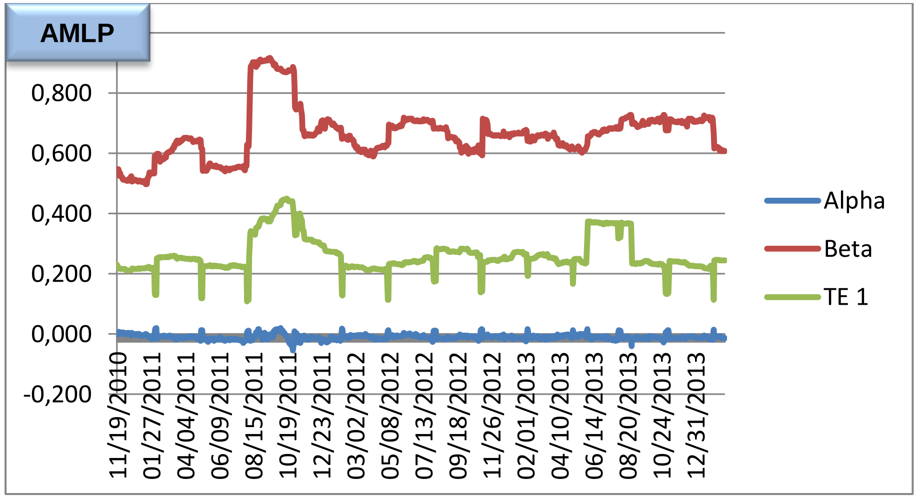
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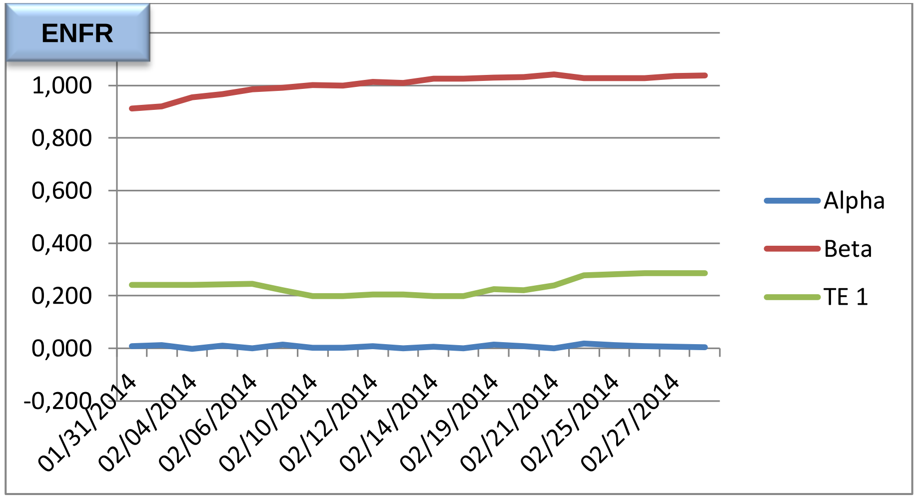
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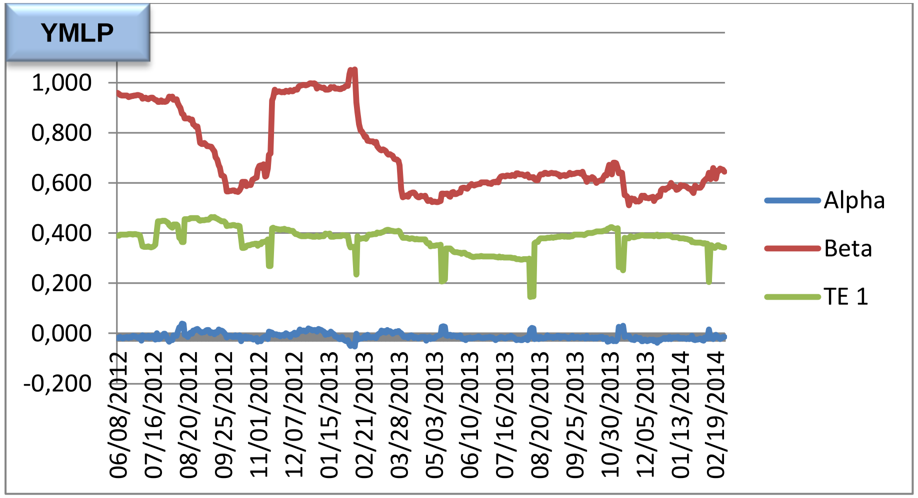
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Beta
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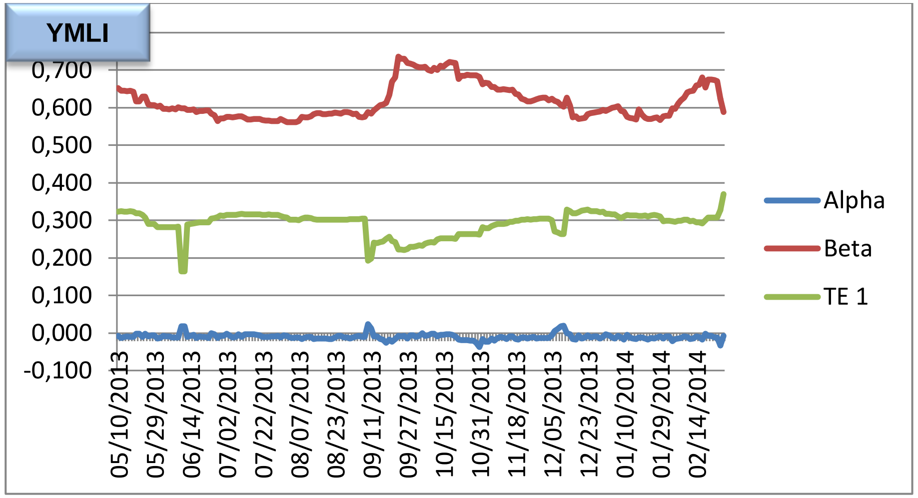
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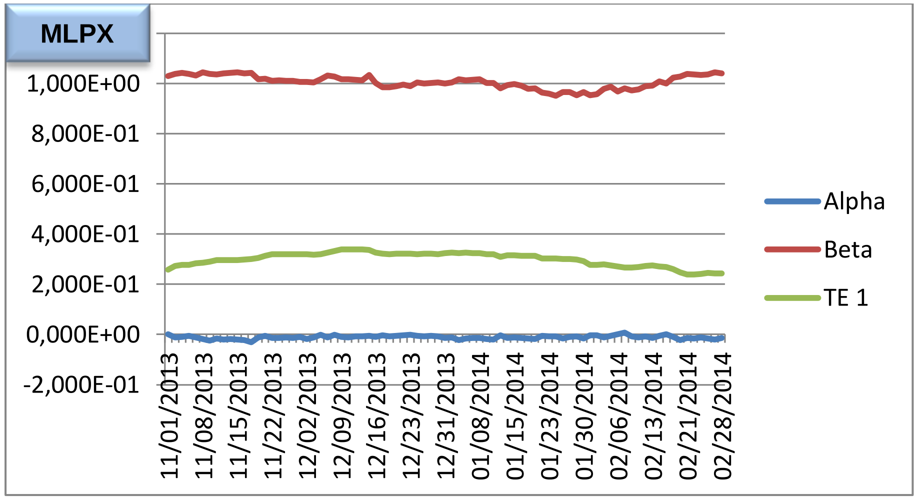
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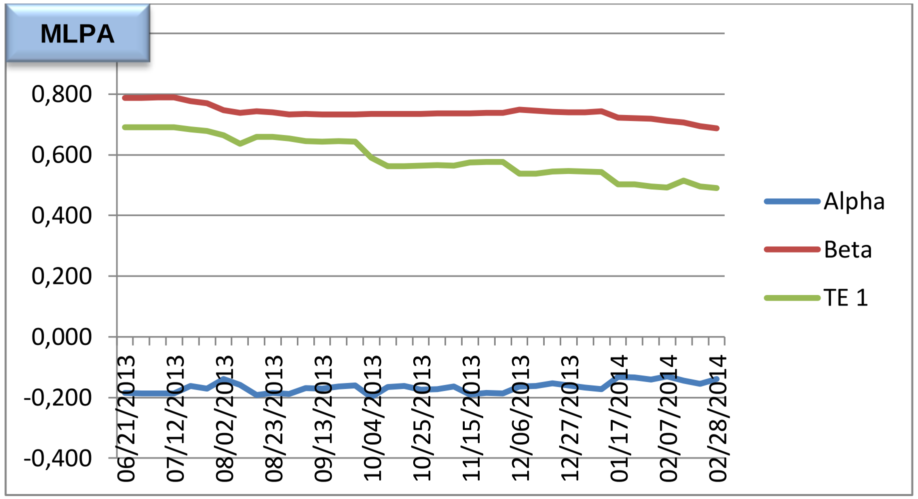
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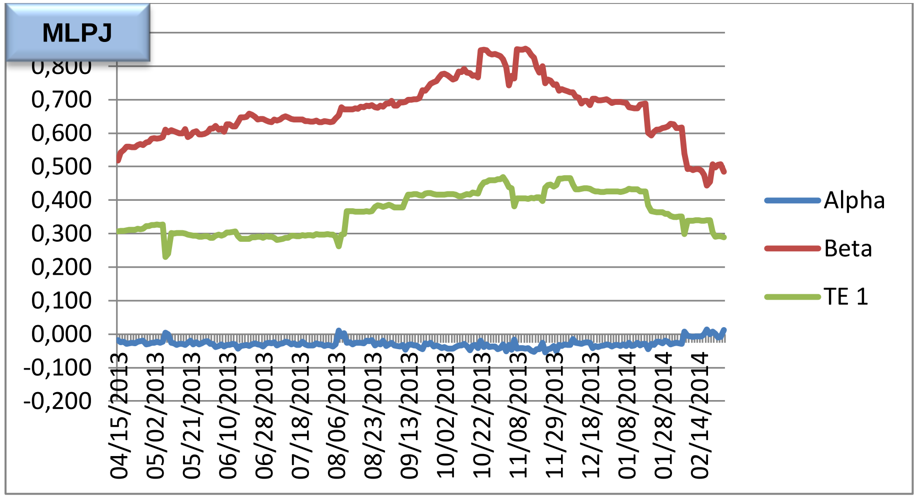
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Alpha
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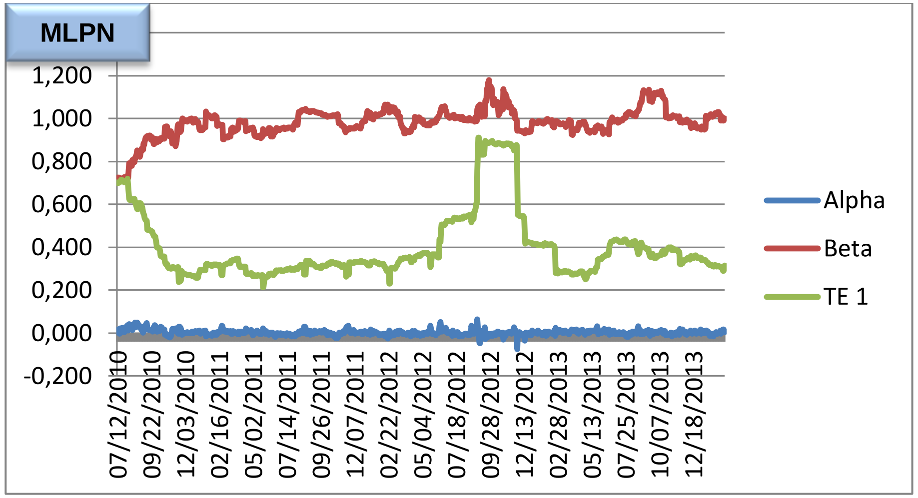
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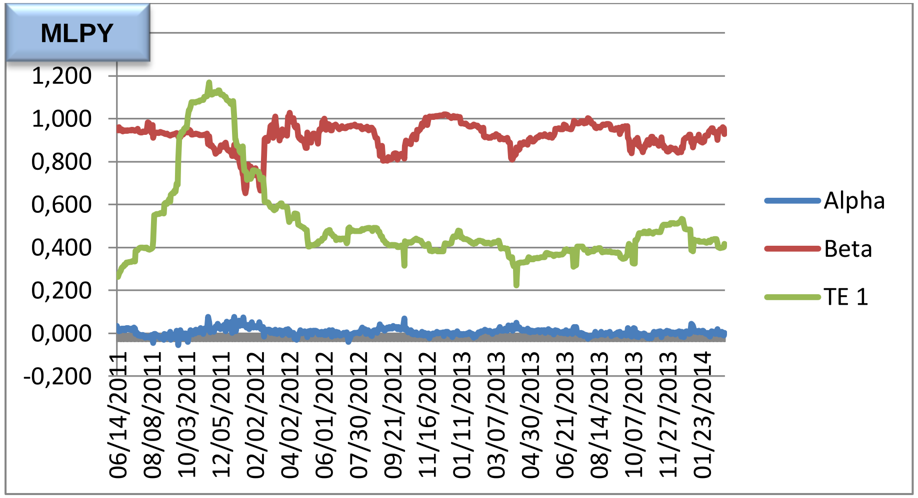
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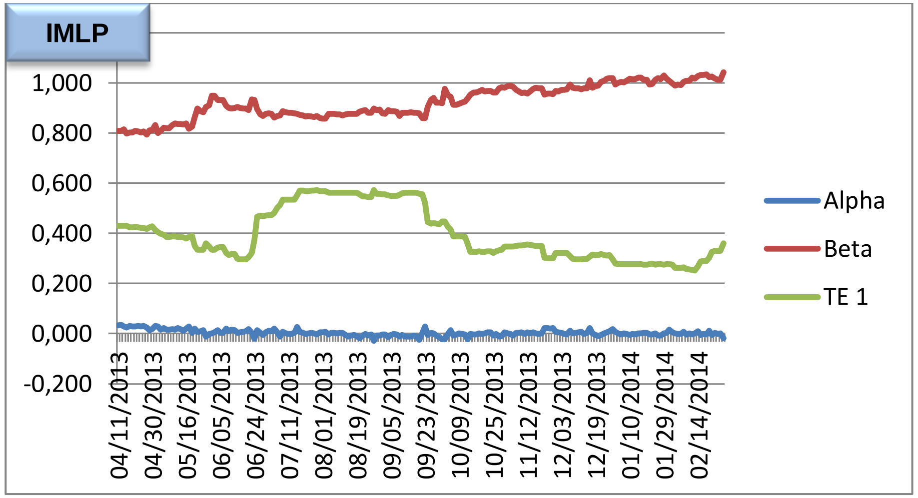
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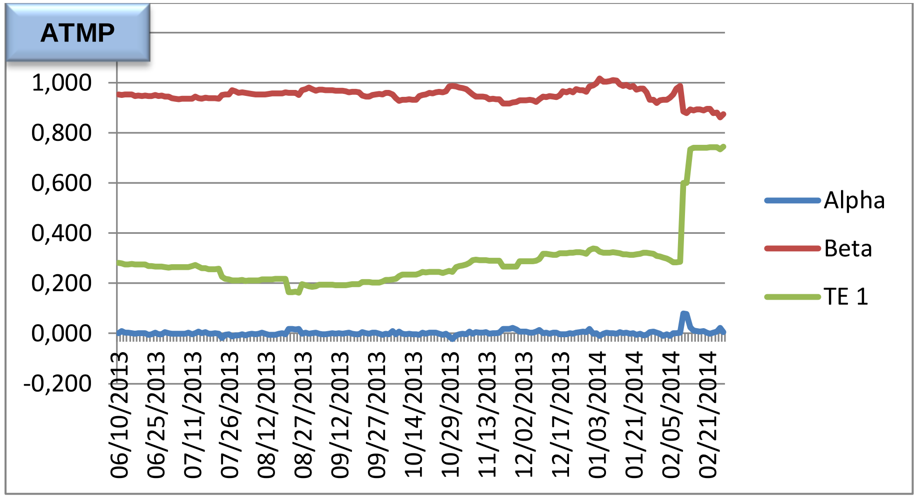
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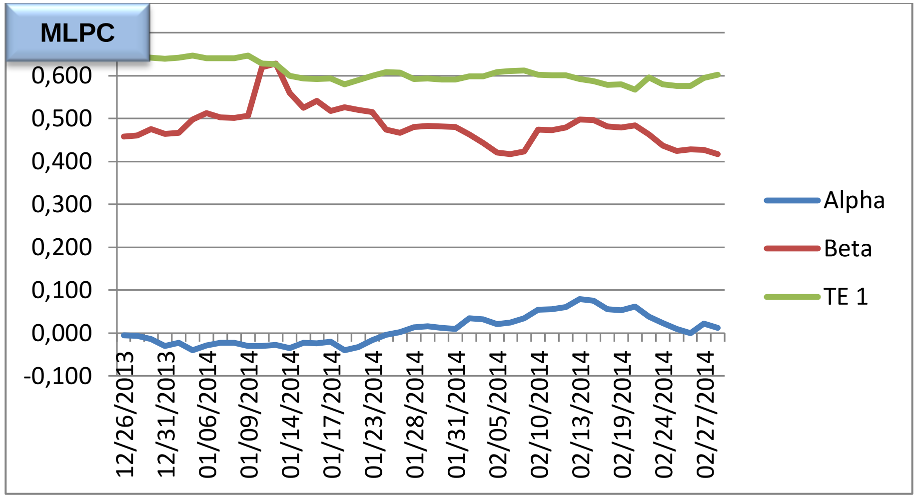
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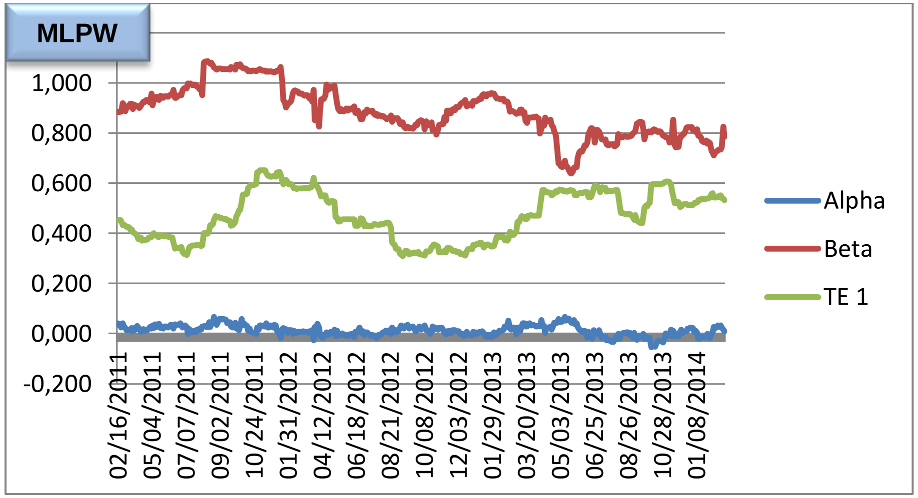
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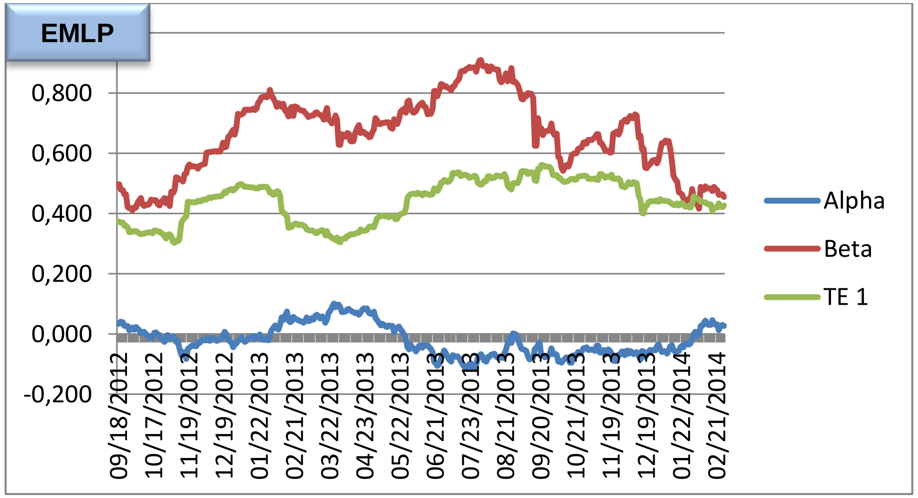
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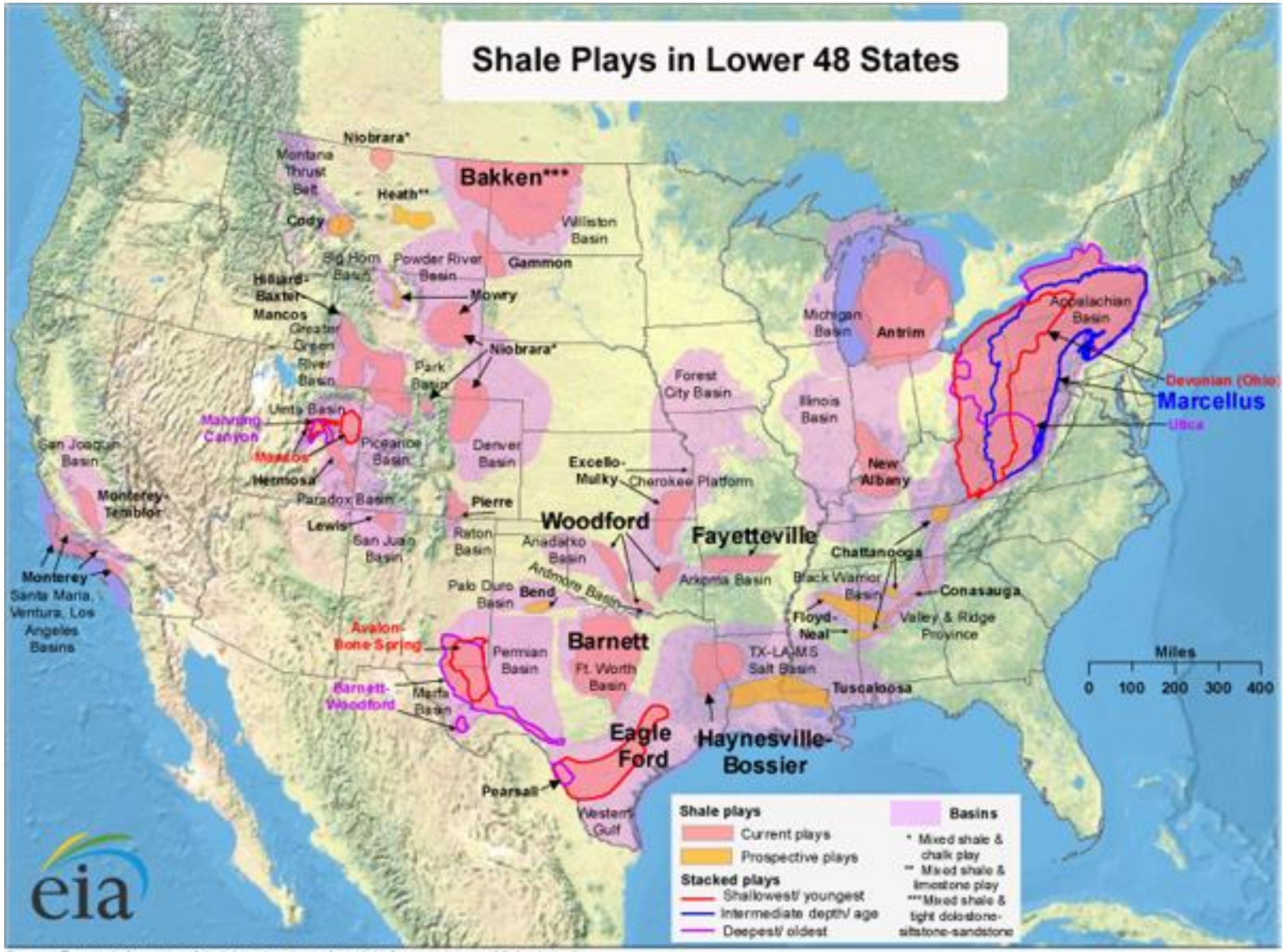
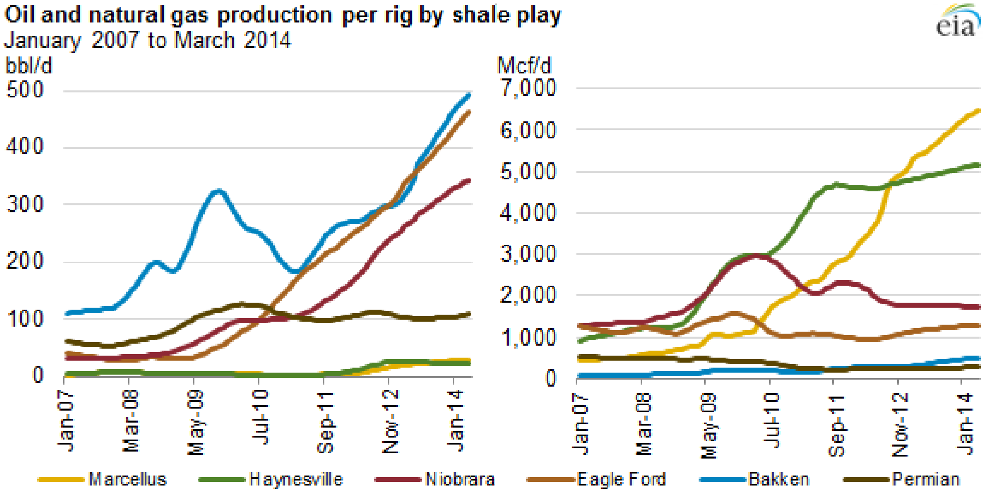
Annex 12

The Shale Discussion



Source: Energy Information Administration based on data from various published studies.
Updated: May 9, 2011



Top ten countries with technically recoverable shale resources

Shale oil

rank	country	billion barrels
1	Russia	75
2	United States	58
3	China	32
4	Argentina	27
5	Libya	26
6	Venezuela	13
7	Mexico	13
8	Pakistan	9
9	Canada	9
10	Indonesia	8
	World total	**345**

Shale gas

rank	country	trillion cubic feet
1	China	1,115
2	Argentina	802
3	Algeria	707
4	United States	665
5	Canada	573
6	Mexico	545
7	Australia	437
8	South Africa	390
9	Russia	285
10	Brazil	245
	World total	**7,299**

Note: ARI estimates U.S. shale oil resources at 48 billion barrels and U.S. shale gas resources at 1,161 trillion cubic feet.
Source: United States: EIA and USGS; Other basins: ARI.