PONTIFICIA UNIVERSIDAD CATOLICA DE CHILE
ESCUELA DE INGENIERÍA

THE OIL PRICE AND THE STOCK RETURNS WHEN RISK PREMIUMS VARY IN TIME AND FIX EFFECTS BY INDUSTRY

FELIPE HERNÁN BEZAMAT

Thesis submitted to the Office of Research and Graduate Studies in partial fulfillment of the requirements for the Degree of Master of Science in Engineering

Advisor:
JAIME CASASSUS

Santiago de Chile, January 2010

PONTIFICIA UNIVERSIDAD CATOLICA DE CHILE
ESCUELA DE INGENIERÍA

THE OIL PRICE AND THE STOCK RETURNS WHEN RISK PREMIUMS VARY IN TIME AND FIX EFFECTS BY INDUSTRY

FELIPE HERNÁN BEZAMAT

Members of the Committee:

Jaime Casassus

Ricardo Paredes

Felipe Zurita

Ignacio Casas

Thesis submitted to the Office of Research and Graduate Studies in partial fulfilment of the requirements for the Degree of Master of Science in Engineering

Santiago de Chile, January 2010

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

This paper explains the cross-section of stock returns with conditional CAPM models that use crude oil shocks as the conditioning variable. The incorporation of these shocks as an explanatory variable is justified by its ability to predict the movements of macroeconomic and microeconomic variables, such as the cash flow and the opportunities for business growth. The family of models proposed is innovative and allows for time-varying risk premia that depend on the oil price. The results show a clear influence of the conditioning variable. The oil price shocks explain a great part of the cross-sectional variation of stock returns when grouping the stocks by size and book-to-market ratio. The models are robust to the inclusion of industry portfolios after controlling for oil consumption. This last result is important since most beta models in this literature decrease considerably their goodness of feet when considering the industry portfolios. The model is also robust when we use oil futures returns as a conditioning variable.

Key Words: asset valuation, oil price, oil shocks, conditional CAPM, conditioning variable.

RESUMEN

Este trabajo explica, en el corte transversal, los retornos de portafolios con un modelo condicional CAPM que usa los shocks del petróleo como variable condicionante. La incorporación de estos shocks como variable explicadora se justifica por su habilidad de predecir los movimientos de las variables macroeconómicas y microeconómicas, como el flujo de caja y las oportunidades de crecimiento. La familia de modelos propuestos es innovadora y permite premios por riesgo variables en el tiempo que dependen del precio del petróleo. Los resultados indican un claro efecto de la variable condicionante. Los shocks del precio del petróleo explican gran parte de la variación en el corte transversal de los retornos de los activos cuando éstos se agrupan por tamaño y razón libro-bolsa. El modelo es robusto en la inclusión de nuevos portafolios como los de industrias luego de controlar por el consumo de petróleo. Esto último es de especial interés ya que muchos de estos modelos perdían su poder explicativo cuando incluían los portafolios de industrias. El modelo también es robusto al incluir los precios de los futuros de petróleo como shock condicionante

Palabras Claves: valorización de activos, precio del petróleo, shocks del petróleo, CAPM condicional, variable condicionante.

1. INTRODUCTION

This work is part of a fondecyt project of Jaime Casassus in which Alberto Tomás Court also worked. In the last decades, a great number of authors has investigated the relationship between the changes in the oil price and the macroeconomic variables. Regarding the relationship between the commodities market and the return on assets, research has been limited. The irrefutable evidence that oil shocks should have an impact on the share value leads to the belief that, finding a model that can adequately incorporate the changes in oil prices, it will achieve a good adjustment in the cross section. The problem resides in the model that will be used. Throughout history, there has been an obvious trade-off between the statistical models such as the APT and the Fama and French Three Factor Model (FF), and the equilibrium models, like the CAPM and the consumption CAPM (CCAPM). The former counts with a good adjustment in the cross section, however, its limited theoretical support lessens this achievement. The latter, on the other hand, has a sound theoretical basis, but when brought to the data, the adjustment is mediocre. As an answer to this, Lettau and Ludvingson (LL) published a series of articles recently where they have "resurrected" the CAPM by demonstrating, among other things that a conditional version of it can perform as well as the FF (see Lettau and Ludvingson (2001a), Lettau and Ludvingson (2001b), Lettau and Ludvingson, (2005a)[1].

It is due to this that, in this paper, there is a proposal of conditional CAPM and CCAPM models where the variable that determines the corresponding factor is the change in the oil price. This specification is innovative within the asset valuation models because it use the oil shocks as explanatory variables, as it allows for risk premiums that vary in time, which fits better the investor's reality. Furthermore, this type of model represents the many ways in which oil makes an impact in the return of the shares.

Oil prices and their movements have been heavily investigated throughout history. Such interest is not surprising, as nine of the last ten recessions experienced by America have

[1] There are a few studies prior to LL that consider a conditional CAPM. Among them Jagannathan & Wang (1996) and Ferguson & Harvey (1999) stand out.

been preceded by rises in the oil prices. In the famous paper Hamilton (1983), the author shows the causality between oil shocks and the U.S. GDP, implying that oil is an exogenous variable that affects the business cycle. This would be supported by the lack of empirical evidence of oil shocks being predicted by macroeconomic variables – including the GPD – and that most price movements can be explained by events such as military conflicts or OPEC embargoes, which are generally considered exogenous (Hamilton 1985). Other authors have repeated the same experiment for the case of the United States and for other countries, reaching similar conclusions (see Burbidge & Harrison (1984), Santini (1985), Gisser & Goodwin (1986), Mork, Olsen, & Mysen (1994), Rotemberg & Woodford (1996), Daniel (1997), Raymond & Rich (1997), Carruth, Hooker, & Oswald (1998) and Hamilton (2003), among others). Hamilton (1983) and Hamilton (2003) document that there exists a significant effect of oil on the economy which manifests with a four-quarter lag.

From a theoretical point of view, several mechanisms through which the oil shocks are transferred into the economy have been studied. Among them, those who stand out are the ones that argue that oil affects the capital utilization rate (as in Finn (1995) and Finn, (2000)), the monetary policy (see Barsky and Kilian (2004)), as well as explanations that emphasize the friction to relocate labour and capital (an example would be Bresnaham & Ramey, (1993)). In recent times, several authors have emphasized the existence of a certain level of asymmetry in the effect of oil prices and that price hikes are more relevant than the falls (see Lee, Ni, & Ratti (1995), Ferderer (1996) and Hamilton (2003) in the United States, Mork, Olsen, & Mysen (1994), Cuñado & Pérez de Gracia (2003) and Jiménez-Rodríguez & Sánchez (2005) for other countries). It is possible that there is no consensus yet on the mechanism nor on the functional form of how the oil affects the economy, but the literature is abundant at the time of concluding that the oil does hold information about the business cycle.

Surprisingly, the relationship between the oil shocks and the economy has remained at a macro level and has not been grounded as it should in the financial markets. The literature that studies the effect of oil shocks and the stocks is limited, and the few existing studies have been unable to reach strong conclusions. Jones & Kaul (1996), using quarterly data, deal with the oil shocks as an exogenous variable and investigate whether the stocks react rationally to these shocks. They conclude that this happens in the case of the United States and Canada, but that there is an overreaction in the case of Britain and Japan. Sadorsky (1999) uses a VAR model to find that, in the american market, oil prices affect the financial market, but that the latter has an insignificant impact on the oil prices. Nanda & Faff (2008) make a cross-sectional analysis by separating the market by industry. They find a significant negative impact of the oil in all sectors except in the mining and oil/gas industries. Recently, Driesprong, Jacobsen & Maat (2008) show an attempt to bring the impact of oil to the equity market. They show, for the first time, that oil has a predictive power on stock markets and by being used as a risk fatcor, it explains the outdated returns.

On the other side, there are studies that are opposed to the casual relationship between the oil shocks and the stock returns. Among them, Huang, Masulis, & Stoll (1996) where they seek a correlation between the daily return of oil future contracts and the stock market returns, getting as a result that this is not significant stands out. The famous article of Chen, Roll, & Ross (1986) looks for macroeconomic variables that determine the market systematic risk using multi-factor models. One of the variables analyzed were the oil shocks, which were discarded due to their low statistical significance.

As a result of the evidence presented above,it is narural to think that oil may have an influence on financial markets. This question becomes even more relevant if the current economic situation is taken into consideration. The effects of oil on the company's value can be divided into those related to the changes in the macroeconomic variables –market risk premiums and interest rates, for example – and those that directly affect the company – cash flows, betas, investment opportunities. If oil is considered as a good predictor of the business cycle, it could affect how the investors quantify the market risk, modifying the risk premiums required for stocks. Also, a rise in oil prices generally produces inflationary pressures that could have a significant effect on the cost of corporate financing (i.e. interest rates), reducing its growth opportunities. Moreover, oil is typically an imput for companies, thus adversely affecting the cash flows. Finally, a change on the oil can modify the energy consumption policies of a company, which, at the same time, modifies the balance between revenues and expenditures which may have an effect on the beta of the firm.

The impact, that oil shocks may have, changes according to the different industries. In fact, when dividing by sector, the microeconomic effect of oil can be clearer. The mostly manufacturing industries consume high quantities of oil, so their returns can be seen to be notoriously affected by changes in its price. Regardeless of this, many can bring this effect to an increase in the price of their products so the returns would no vary greatly. This is seen in Kilian (2007) where it is demonstrated that for certain commodities the rise in the oil price can cause a rise in returns. One the other hand, those that consume less quantity or practically none (or "less" manufacturing) will have a greater impact at the macroeconomic level than at the microeconomic one. No matter the case, the effect should be a negative one since the macroeconomic impact is inevitable.

Such has been the impact of the conditional models on the theory of asset valuation, that many authors have followed this line and have planned their own conditional models. Santos & Varonesi (2006) using the labour income to consumption ratio and Lustig & Van Nieuwerburgh (2004) where they apply the housing wealth to human wealth ratio are remarkable examples.

Despite the good results of conditional models, writers that are more critical and that have written a series of articles that have cast doubt about their merits have recently appeared; (Lewellen, Nagel, & Shanken (2008), Lewellen & Nagel (2006), Daniel & Titman (2006)). The important thing is that the criticism does not point to the theoretical basis of the model, but rather presents tests where the main conditional models fail. It is vital to establish the validity of these tests and give them the importance they deserve. Particularly, there is a proposal for the expansion of the portfolio set beyond the book-to-market ratio and size classification defined by Fama and French by including the portfolio of 30 industries. The authors indicate that it may be useful to add portfolios as long as they exhibit a variation in the expected returns or in the risk. In addition, there are many models that explain very well the book-to-market ratio and size portfolios, so by adding the portfolios of industries value would also be added. Besides, the aforementioned would go hand in hand with the various effects already mentioned when using the oil variable as a conditional. The investigation of the effects by industry has been limited. Jorgenson, D. & Stiroh, K. (2000) analyzes the effect by country and declares that it is very difficult to find a general productivity measure for all industries and that the best course of action is to separate. Lee, K., & Ni, S. (2002) also make an analysis of the industries showing that the effect of the oil shocks can come from the side of supply or demand depending on the level of cost share that oil represents in the analyzed industry. This motivates to incorporate new information based on the percentage of sales that oil presents per industry. Wooldridge (2002) talks of fixed effects as the effects that might be being produced.

This paper intends to prove three things. First, that the there exists a relationship between the oil shocks and the stock returns. The equity risk premiums depend on the economic expectations of the investors and oil has a certain predictive power over them. Second, that the proposed CAPM and CCAPM conditional models achieve adjustments in the cross section that are higher than in the original versions and comparable to the Fama and French Three Factor Model and Lettau and Ludvingson's conditional models, which makes them a good alternative at the time of valuing the assets. Furthermore, the paper intends to demonstrate that the effect of the oil shocks varies when considering the portfolios of industries so that the weight – given by the consumption of each sector – influences the results. Finally, it intends to show that oil has such a good predictive power that the commodity future and other robustness tests likewise validate the estimated models.

The remainder of this paper is composed in the following way; section two describes the motivation behind the use of oil shocks as the conditioning variable. In the third section of this paper, the analyzed models for both the 25 portfolios sorted by size and book-to-market ratio, and 30 industries have been included. Section four presents the main results of these portfolios where the adjustment of the different models is shown. In this section, the proposed models were compared with those specified by other authors; the CCAPM, the Fama and French Three Factor Model, an APT type model that uses oil as a factor and Lettau and Ludvigson's model that uses the as a conditional. In the next section a robustness test of the models using the oil future and another one emphasizing the specification are shown. In section seven the intuitions of these models is shown, and to finish, the conclusions are made in section eight where the possible alternatives and extensions are analyzed.

2. THE CONDITIONING VARIABLE: OIL

The variable that conditions the risks factors is the key for any conditional model. Besides the fact that oil is a high frequency variable that can be observed, it is important to establish relationships that connect it with the return of the shares. In this section, a link between the changes in the oil price and the U.S. GDP, the return of the shares and the effect per industry, which justifies the selection of those shock as a conditioning variable will be made.

A conditioning variable must summarize the information that the investors possess to make an investment decision. A good way of achieving this is by looking at a variable that is able to predict the movements of the business cycle as it is known that it has the property of determining the risk premiums. The relationship is a direct one, in economic downturns people invest less, which decrease stock prices due the demand, increasing the risk premiums. On the other hand, when there are economic expansions, the investment is larger, increasing the stock prices and lowering the risk premiums. With this, it can be seen that a variable that is able to predict the business cycle will push the expectations of the investors, which makes it a good conditioning variable.

Hamilton (2003) demonstrates that there exists a casual relationship between the U.S. GDP and the oil shocks by running a regression of the real growth of the U.S. GDP in relation to real lagged growths of the GDP and to lagged changes of the nominal price of oil[2]. Regardless of this, it has been demonstrated that the causality revealed has been loosing strength with time, which has been associated to the existence of an asymmetry in the way in which oil shocks influence the macroeconomy. This asymmetry would be reflected in that the increase in oil prices has more influence than the decrease, which would explain why statistical significance of the oil shocks as a variable has been diminishing, since the declines in oil prices were not very common until the mid 80s.

---

[2] The changes refer to logarithmic changes.

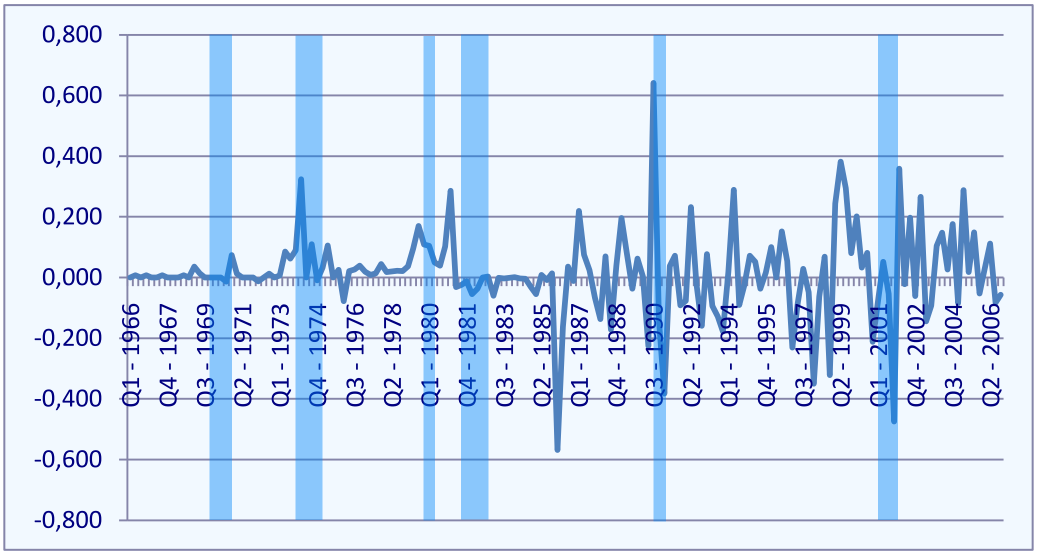

Figure 2.1: Changes in oil price.

The aforementioned can be seen clearly in Figure 2.1, which shows the changes in the nominal price of oil during the last 60 years along with the corresponding recessions designated by the NBER (National Bureau of Economic Research) which are represented by the shaded area.

The oil shocks need to be able to anticipate the business cycle to be a good conditioning variable. Nevertheless, it is also extremely important to be able to explain a direct relationship between them and the return of the shares. Assuming that the return of the shares is given by the equation (2.2), it can be seen that this can be affected by three aspects; the risk of free rate ( ), the price of the risk associated to a certain factor ( ), and the amount of risk to which the company is exposed ( ) due that factor.

(2.2)

By multiplying the price of the risk by the amount of risk that the company is taking, the expected risk premium is obtained.

Within the macroeconomic effects, the impact of the changes in oil prices (demonstrated in the previous section) and the influence in the interest rates due to inflationary pressures that are exerted by the increase in oil prices are highlighted. The business cycle has a direct relationship with the risk of price as in some economic bad times, the people, looking to lower their consumption, prefer to consume rather than invest, which by demand makes the price of risk associated to certain factors increase. On the contrary, when the economy goes through good times, people tend to invest more, which makes the risk price that emerges from these factors decrease. The interest rates are related to the risk free rates which, as it has been seen before, have implications for stock returns.

The microeconomic effects are more complicated. Since oil is an input in most companies, it affects the cash flows directly. Along with this, it can be seen that the high and low prices of the input can have consequences on the energy consumption policies and in the production levels of the company. These two factors clearly affect the cash flows, which at the same time affect the amount of risk that a company takes due to a risk factor.

If classified by industries, it is clear that the shock of the changes in the oil price is given mainly by consumption. Unlike diversified portfolios, the portfolios of industries will be able to be classified by their consumption level (or by how much they manufacture). Particularly, the mostly manufacturing industries will have an expected major impact as they consider oil as an input. This will affect the consumption policies, modifying the cash flow so the effect on the industries produced by the consumption is distinctive.

However, the shock can be cushioned if it is transferred to the final sales. For example, an increase in the oil price can bring a company to an increase in the sale prices so their returns would not be affected greatly. On the other hand, there will be other industries that will not be able to bring to the sales the changes in the oil price as an input, so their returns will vary considerably.

The less manufacturing industries that, therefore, are assumed to consume in lower quantities, will only have a macroeconomic effect of the oil. The microeconomic shock could then be neglected. Anyways, it can be expected that the macroeconomic effect that was explained before will affect negatively and indiscriminately all sectors.

Finally, the sales level of the sector will also be important. An industry can consume fuel in large quantities, but at the same time, these represent a low percentage of the sales so there is no great effect. What will matter then, will be to quantify the consumption as a sales ratio to have a clearer impact on the analyzed industry.

Hence, if the industries are considered, it is to be expected that not all sectors will have the same effect, so an extraordinary factor, that is proportional to the weight of the sector and to how manufacturing it is, would have to be added. This will correct mainly the microeconomic factor that produces an effect when classifying by industry.

Ultimately, the effect on the interest rates has an impact on the growth opportunities of the companies, as it has implications on the debt level needed to start new projects. This change in the growth opportunities reaches the cash flows, which once again influence the amount of risk associated to a certain factor that the company takes.

As it can be seen, the impact of the changes in oil prices and the return of the shares is a complex web of interactions. As there are multiple ways that show a certain level of causality, it is natural to propose models that link these variables. In short, the equation (2.2) could be presented as (2.3).

(2.3)

Where the are the changes in oil prices. This evidence leads to the planning of conditional models that include the oil prices in the following section.

3. THE MODEL

Once justified the use of oil as a conditioning variable, it is necessary to look at the consequences of this choice and which form would the models that consider this specification take. This paper will consider market CAPM and consumption CAPM conditional models where the conditioning variable is the changes in oil prices.

Equilibrium models stem from the first order condition basis of an investor that can decide when to invest on the different instruments of the economy and how much capital to consume (see Cochrane (2005)). From this it is derived the basic pricing equation showed in (3.1).

(3.1)

Where the conditional discount factor has been defined as

(3.2)

One way to understand the above is through a linear relationship between the discount factor and the risk factors that are considered:

(3.3)

This model assumes that the returns from the different stocks depend solely on their covariance with common components or risk factors. When the values of a and b remain constant there is the particular case of the familiar CAPM and CCAPM[3].

One possible reason for the bad performance of equilibrium models such as the CAPM and the CCAPM is that their original versions do not allow for variable risk premiums, evidence that has become more and more accepted in the literature of asset valuation (see Campbell & Shiller (1988), Fama & French (1988), Fama & French (1989), Campbell,

[3] In this case, the discount factor is linear and depends simple on the f factor that can be the return of the market portfolio ( ) or the porcentual shocks of the aggregate consumption ( ). This discount factor

For more details see Cochrane (2005).

(1991), Hodrick (1992), Lamont (1998) and Lettau & Ludvigson (2001a)). The conditional models appear as an answer to the problem above, as they include a variable that "conditions" the risk factors, which allows the adjustment of the risk premiums as time goes on.

The derivation of the conditional models springs from the fact that, unlike the static versions, the payments and the discount factors are not supposed to be independent and identically distributed (iid) over time. This makes the stochastic discount factor continue with a linear relationship and the coefficients and are functions of the state of the economy in , which means that investors expect a certain return of given by what they see in . Looking at it from an economic point of view, it can be said that the investors know the information about the state of the economy at the time of defining the positions in their investment portfolios (and are known in), which generates expectations on the risk premiums for the next period. When the information is known in , it makes predictions of "good" times and people demand lower risk premiums of the assets which makes the prices rise, while when "bad" times are expected, the demand is for higher risk premiums which reduces the price of the assets.

The way in which the conditional models make the coefficients and depend on the state of the economy is by making them depend linearly on a variable that reflects the information that the investors possess in , and that gives them the expectations for the next period (see (3.4) and (3.5)).

(3.4)

(3.5)

The variable is the one that "conditions" the return of the assets, as it is a good predictor for the business cycle and in our case represents the shocks of the changes in oil prices.

The equilibrium models have only one fundamental factor (or), but the unconditional version of the model includes other factors associated with the variability of the Sharpe Ratio which aims to improve the adjustment. In this case, a relationship between asset returns, the fundamental factor, the factors that condition the coefficient and the covariance between the factors that condition and the fundamental factor (see chapter 8 of (Cochrane, 2005)) is obtained. Said relationship shows in the formula (3.6).

(3.6)

With this, there are two new models; the CAPM-oil and the CCAPM-oil with the form of equation 3.6 in which the f factor would be and respectively.

Another effect that is intended to be investigated is the lag that seems to exist in the way in which the oil affects the returns. The inflationary pressures mentioned in section 2 can be reflected some periods later and not immediately, which leads to think on a possible lag between the oil shocks and the effect on the returns. Furthermore, as it was seen in section 2, it is the fourth lag of the oil shocks that influences the most the U.S. GDP, which leads to the belief that the state of the economy can be predicted by the oil four quarters in advance. This way, the equations (3.4) and (3.5) are[4]

(3.7)

(3.8)

With which new specifications for the proposed models are obtained that present the same form of equation 3.6 that will be called CAPM-oilD and CCAPM-oilD. These four models will be tested to see their adjustment to the cross section and will be compared with other known asset valuation models so as to have a reference point. When analyzing the industry portfolios, information of the industry weight will be added through the aforementioned consumption variable. This will be used as the ratio between the fuel consumption (oil proxy) and the net sales of the sector (value of shipment) explained in appendix C. This variable is consistent with the effects exposed by Lee, K., & Ni, S. (2002) as it represents the oil cost share for the industry. This way, the same conditional models will be used, but with the addition of some variations so as to improve the adjustment.

---

[4] The z variable has a t-3 subscript since the factors are measured in t+1. Thus, the total lag is of four periods. It is important to note that the conditional variables are outdated by one period with the risk factors by themselves.

In this case, a and b will depend on each industry as it is showed in 2.8 and 2.9

(2.8)

(2.9)

This way, in the beta versions, new terms that can be seen in formula (2.10) appear.

(2.10)

This variable will give new information when the portfolios are classified by industry due to the microeconomic effect that oil has and that is explained in section 2. This weight will be avoid for the size and book-to-market portfolios, as they are supposed to be correctly “diversified” in what respects to not representing one specific sector. The information included referred to as weight of the industry is related with the fixed effect that exists in industries. Wooldridge (2002) refers to this type of variable as a not observed effect or conglomerate. In particular, it is a variable constant in time that cannot be incorporated separately; it can be interacting with variables that change in time just as it was done in this model in which risk premium varies.

The use of this variable will be equal to that of an industry weight so it will be assumed to be constant. The same lags mentioned before will be used then but with a new variable added.

4. EMPIRICAL RESULTS

4.1. Results for the portfolios sorted by size and book-to-market ratio

Several models that could explain the stock returns of the 25 portfolios sorted by size and book-to-market ratio were studied. The data and the methodology used can be seen in Appendix A. In first place, the CAPM and the CCAPM were seen and they showed a low adjustment. The first model barely reaches a 2% in the cross section and the coefficient λ corresponding to the market portfolio is negative, which makes no sense economically speaking[5].

Table F.1 shows the results of the selected conditional and unconditional to analyze and compare. In the first place, the CCAPM is somewhat better when it comes to the adjustment, but it is far from being an accurate reflection of what actually happens, obtaining a close to the 17%, which is far from being a good adjustment. Then, the APT type models that were tested included as a variable the changes in oil prices. These models show that including the oil as a risk factor improves the adjustment in the cross section, but is not all that considerable, reaching a 33,5% explained. This creates new possibilities, as oil has been considered as a bad risk factor by several studies that have analyzed it. According to this result, people would consider the oil price at the time of investing, nevertheless, due to market frictions, this consideration of the price would last in time.

On the other hand, the FF model is consistent with what has been exposed in the literature, with a surprising adjustment in the cross section near to the 80% for the OLS estimate. The level of significance of λ corresponding to the HML term near the 99% stands out. An important point in this model is, once again, the negative sign of the λ

[5] The coefficient λ represents the compensation for risks, then, for risk averse individuals, it ought to be positive.

associated to the market return, which makes no sense financially or economically speaking. Also, the value of the constant is high, which is not a good sign when it comes to the form of the model.

Then, in the same table, the conditional models that were analyzed in this paper are shown. The factors used were two; the return of the market portfolio and the logarithmic changes in the consumption. On the other hand, the conditioning variables tested were the oil shocks ( ) and the well known variable elaborated by LL, which achieves good adjustments in the literature. It is important to highlight that two specifications that use oil as a conditioning variable are considered. In the first one, the oil shocks are seen in t to then estimate the returns in , while in the second one, the oil shocks are seen in to estimate the returns in . The former is the typical conditional version that is presented in literature, while the latter is the lagged version that was mentioned before.

The results at a general level show a clear improvement in the adjustment of the conditional models compared to the unconditionals. For example, it can be seen that the conditional versions of the CAPM have an adjustment that fluctuates between the 54% and the 60% depending on the conditioning variable used, while the conditional models of the CCAPM vary between the 60% and the 68% of adjustment in the cross section.

The conditional CCAPM models that were tested with the same conditional variables have in general a better in the cross section. The first CCAPM model that uses the variable as a conditionant takes the term corresponding to the conditional variable on its own since it is not significant, just as the LL did in (Lettau & Ludvigson, 2001b)[6]. This specification reaches an adjustment of the 59% where the cross term is significant in its corrected and uncorrected t-test.

The second model analyzed is of the CAPM type, but the conditioning variable is the oil shocks. The adjustment in the cross section is good (higher than the 58%), but what surprises about this model is the high significance of the cross term (significant to the

---

[6] Just like these authors do, the variable is only elided in the second step of the Fama-MacBeth methodology. That is to say, it is still used to calculate the betas in the first stage.

99%) and the low constant value compared to the other models, which makes it more credible. The next conditional model is also of the CAPM type and uses oil shocks as a conditionant, but with a lag of four periods. The adjustment in the cross section of this model reaches almost a 60% and obtains significant values for the coefficients of the conditionant variable and the cross term even in its corrected t-tests.

For the CCAPM type conditional model that uses oil as a conditional, an adjustment of the 68% can be seen, but at the same time, the cross term becomes significant at the 95% in its corrected and uncorrected t-tests. The last model that appears in that table corresponds to the conditional CCAPM specification were the conditioning variable is the fourth lag in the oil shocks. This model surprises with an adjustment of a 65% in the cross section and has a highly significant t-test for the coefficient that it uses.

In these tables, it can be seen that the magnitude of the Shanken Correction that is applied to the t-tests depends on the model that is being used. This is due to the fact that it is directly related to the magnitude of the λ estimators and inversely related to the variability of the factors. This makes conditional models to have a large correction as the variable of its terms, especially the cross term, is very small. On the other hand, models like the CAPM have larger variance values (in relation to the λ estimators), which makes the correction minimal.

Another point worth analyzing is the fact that the estimated constants are in general too high. As it has already been said, their value should be similar to the free risk rate, however, their value doubles it most of the time. In relation to this, it is necessary to state two things. First, finding high values of the constant is common in the literature (For example, Jagannathan & Wang (1996) and Lettau & Ludvigson (2001b)), which can be seen in this paper when seeing the high values of the constant in the models that were used as a benchmark. And second, the models that use oil as a conditional present lower values for the constant than most of the other values analyzed.

Finally, it is worth highlighting the low level of adjustment that the models have in general when a GLS estimation is made. Moreover, none of the models analyzed – either proposed or used by the literature – reaches a 35% of adjustment, so a relative criterion will be used to see if a model is better than another.

4.1. Results for the portfolios sorted by industries

One factor that remained constant throughout the tests mentioned above was the 25 portfolios, sorted by size and book-to-market ratio through which the adjustment in the cross section was analyzed. In this section, varying the composition of the portfolios used while keeping the original time window is intended. This is done with the aim of proving that the proposed models have predictive power beyond the size book-to-market ratio.

Following Lewellen, Nagel, & Shanken (2008), a classification of 55 portfolios is proposed, where 25 Fama and French portfolios sorted size and book-to-market ratio are included, plus 30 portfolios sorted by industry that were also classified by said authors. Lewellen, Nagel, & Shanken (2008) propose this test in particular as they add portfolios that are not significantly correlated with the SMB and the HML so their estimate delivers great value. This portfolios exhibit variations in the expected returns and in the risk, so they are consistent with what was proposed by the authors.

Consistent with Lewellen, Nagel, & Shanken (2008) findings, a clear detereoration of the adjustment in the cross section for all the analized models can be seen in Table F.2. The low adjustment levels are not an exception for the proposed models that include oil in their specification. Nevertheless, the cross term of the CAPM that uses oil as a conditionant and the term that corresponds to the fourth lag of the oil shocks keep a significance, which motivates the incorporation of new information to the model. For this, the industry weight variable composed by the consumption and net sales ratio explained in Appendix C was added. In this model, only the portfolios from which this right was possessed were considered. This way, 21 industry portfolios were used – leaving 9 apart – that are shown in the table C.1 plus French's preset 25.

The results of the proposed models that have the industry portfolios added can be seen in able F.2. In first place, an APT in which the oil shocks and the consumption are used as variables is present. The adjustment of this model is quite low, reaching only the 4% of variability explained, different to what happened when the 25 portfolios were used which reached the 30%.

On the contrary, the FF presents a good adjustment and all its variables are significant at the 95%. The R^2 is of the 42%, which is an acceptable level. However, the same criticism of this model due to its lack of economic strength remains.

As for the conditional models, the changes in the consumption logarithms were used as the sole factor as they presented the best results before. In the first place, the conditional model proposed by LL, where the conditioning variable is , is presented. The explained percentage is notoriously low (lower than the 25%), but the cross term is highly significant.

Regarding the conditional model using oil as its conditioning variable, the R^2 is slightly higher, reaching the 33%. Once again it is worth to highlight the significance of the cross term which obtains a t-test well over the 90%, which justifies its use as a conditioning variable.

When it comes to the significance of the estimators, the APT models loose their significance in their t-test. Yet, the only term that remains significant at the 95% confidence level – at least in its uncorreceted t-test – is the cross term for the conditional models. The high significance coupled with the motivations of Lewellen, Nagel, & Shanken (2008) invite to include more information from oil with its great predictive power. This information should be related to oil and its microeconomic properties as it was seen in section 2.

For that, the model that includes the industry weight is finally presented. The CCAPM-oil-ind 1 shows the result of the unconditional model, this time adding all possible information on the industry weight. It is seen immediately that the explanatory power of the model reaches a very high R^2 with a 57% of explained variability. As the number of variables is increased, it is necessary to observe the adjusted R^2 that remains over the 50%. It is important to highlight the existence of two variables that do not have an explanatory power and are thus discarded; the industry dummy and the oil price shock, both multiplied by the weight. It can be seen that the added information gives great explanatory power to the model and a high significance of the parameters is obtained. The term accompanying the original CCAPM consumption shocks remains hardly significant, but the one accompanying the industry weight has a high significance value (over the 95%). The cross term has, at the same time, a high significance for both the original unconditional model and the one accompanied by the weight. The fact that the significance of the variables that accompany the consumption is so high is of great power for the CCAPM, as they justify its use as an explanatory model. This does not happen in the models mentioned before.

5. ROBUSTNESS TEST

One way to prove that the relationship found is not spurious and that the proposed specifications have effectively predictive power over the return of the shares, is by observing the robustness of the model, which can be done by applying the following tests.

5.1. Future as a conditioning factor

One way of proving the robustness of the proposed models is through the oil future that is traded in the market. Given that this future is not about the producer price, it is not possible to combine it with the spot priced used as shock in the last sections. Regardless of this, it is clear that the correlation is too high, as it is over even the commodity itself. Therefore, to include it as a conditioning factor, the unexpected effect of its value was used. That is to say, the shock of the difference between the logarithm of the future for four months and another one for one month were used, both for the same date. The resulting models are consistent with the equation 3.6 using as a conditional the shock described before and the and factors, leaving the CAPM-oilF and the CCAPM-oilF models respectively. By assuming the drift of a future is void, the difference between those two values would be the unexpected factor that hits every company given by the oil price. It is worth to highlight that the information of the futures obtained from the year 1985 onwards, so the models were reestimated for this period.

Table F.3 shows the results of the estimated models for this period. In the first place, the conditional CAPM models that were used in section 4 using as a conditioning variable the oil price shock for one and four lag periods are presented. The results obtained are consistent with the estimates in the last section, obtaining R^2 higher than the 49% in both cases. The CAPM conditioned with one lag period of oil shocks maintains the high significance of the cross term, which gives it a high explained variability. Curiously, when four period lags are used, the cross factor takes no significance.

The third model presented is the same CAPM model but incorporating the future information instead. It is immediately seen that a high R^2 of the 49% is obtained and the cross term between the market return and the significant future is of the 90%. Therefore, by using the market return as a factor, satisfactory results are still obtained, which justifies the use of the conditional models to explain the returns of the shares.

The next model presented corresponds to the conditional model with one lag in the oil price shock applied to the CCAPM. In this case, an R^2 of the 42% is obtained. Contrary to the expectations, the cross term does not acquire any significance. This does happen in the next model which is similar, but uses four lag periods for the oil as a conditional. In this case, the estimated R^2 is superior to the 50%.

Finally, the CCAPM conditional to the future shocks is shown. The estimated R^2 decreases in comparison to the CAPM conditioned to the future shocks, but, it is still relevant with a 34%.

Therefore, when using the future price shock, the results are still consistent with the expectations. The oil, when used with both its spot price or its future, is a conditioning factor that delivers information relevant to the CAPM and the CCAPM and improves the adjustment.

5.1. Other robustness test: Specification test

This section seeks to investigate if there is any residual effect of the characteristics of the firm in the proposed models. This type of analysis is common in the literature, as it helps to verify if the specification of the model is correct[7]. The characteristics of the firm that will be used are the size and the book-to-market ratio. If significant values are obtained for said characteristics, there would be evidence to believe that the model is specified

[7] It has been demonstrated that the Fama-MacBeth methodology can make "useless" factors appear as significant. In (Jagannathan & Wang, 1998) it is demonstrated that said factors are unable of "getting" the regression characteristic of the companies such as the size or the book-to-market ratio. By "getting" it is understood that the t-test that corresponds to the factor in question is not significant to the 95%, that is to say, less than a 1,96.

wrongly. The results of said test for the proposed models are presented in Tables F.4 and F.5[8].

In first place, it can be seen that the FF model surpasses the test at 95% for both the size factor and the book-to-market ratio. Regardless of this, this is made slightly due to the fact that if it relaxes to the 90% it would not achieve it, so the FF model would face trouble before this test. Regarding the CAPM conditional model using as a factor the variable, it can be seen that both the size variable and the book-to-market ratio do not acquire significance, achieving to pass this test.

On the other hand, it is seen that the conditional versions of the CAPM present complications to "get" the size and the book-to-market ratio of the regressions, so they would not pass the test. This happens with both the oil variable for one lag period and for four lag periods. This does not happen with the conditional versions of the CCAPM that pass this test with both of the conditioning variables that are proved of the oil. This makes the focus turn to the CCAPM type models rather than to those that use the return of the market portfolio as a factor.

---

[8] Numerically, what is done is to estimate the beta in the first phase of the Fama-MacBeth methodology and then run regressions of the second phase adding the last term shown in the equation

,

Where denotes one characteristic of the firm that, in this case, can be the logarithm of the size or of the book-to-market ratio. In Tables 6.4 and 6.5, estimators of the variable are reported for both analyzed characteristics.

6. VALIDATION: OUT-OF-SAMPLE PROOF

In this section, a more direct and detailed comparison between the conditional models that use oil and the variable is intended; this is done with the aim of showing that oil is a more trustworthy variable. The theoretical base for this is related to the criticism that has been done to the variable. The argument is the following: the must be calculated for the sample in question, then its value will depend on the period of time taken into consideration. This talks about the use of future information to construct the cointegrated vector that determines it, which generates a future bias or look-ahead bias. One way to prove that this look-ahead bias exists is by looking at the predictive power "out of the sample" of the model and seeing if its results are closer to the reality.

To do this, the conditional models of the CCAPM that use the oil shocks (normal and lagged) and as a conditional will be calibrated for a specific period of time. Then, said calibrations will be used to see the predictions of the models for the returns of each portfolio in the following quarter. This prediction will be compared with the real value of the returns to see the mistake made in each specification. To make the prediction more realistic and with the information that the models would actually count, this would be recalibrated each time that a prediction of the returns for a new period of time were wanted. In practical terms, this means that the prediction will be made for the first quarter after the calibration only. The data and the methodology used are shown in the appendix D and E.

The case of the variable is a separate issue, as the difference in the oil price, that is an objective value that is known in each period, must be calculated for the whole sample. This makes it hold future information that should not be known. Despites this "disadvantage" that the model that uses the as a conditional would have, the results of the models were compared directly.

6.1. Results

The main value that will be analyzed to determine the adjustment of the models will be the mean square error of each estimation, which is the root of the sum of squared errors of each portfolio for a given calibration. As a similar value to that error, the R^2 of the cross section (out of the sample) will be reported for the different models in each of the periods analyzed[9]. Table F.6 shows the mentioned data for the different models that were tested, which allows to establish a direct comparison and outside of the sample for them.

As it can be seen in said table, both error values and those from the adjustment in the cross section (R^2) are not comparable with those values within the sample. A clear increase in the error and a smaller adjustment can be seen. Regardless of this, it can be seen in several periods of time that there are estimations that are pretty close to the reality, which leads to the belief in the existence of a certain level of real predictability of the models.

By making a detailed comparison, it can be seen that the model that uses oil shocks as the conditional (CCAPM-oil) is superior to the CCAPM-cay model. Also, said model is even better than the FF model, which used to lead in terms of adjustment within the sample. This result is extremely relevant as it shows that in the practice, the models that use oil to estimate the stock returns have real validity and may be even superior to the commonly used models in the practice.

Another result that can be seen is that the model that uses the lagged shocks does not have a great adjustment outside of the sample, which takes away some credibility. On the other side, the CCAPM-oil, FF and CCAPM-cay have similar mistakes for the different dates out of the sample, nevertheless, the lagged CCAPM-oil model shows good adjustments when the others do not, but bad adjustments when the others are closer tot he real value.

This results are extremely important, as one desirable quality of the asset valuation models is their ability to predict data out of the sample. This type of adjustment allows to

---

[9] It could be thought that the R^2 has to see the calibration adjustment, but there is an emphasis on the R^2 belonging to the 25 portfolios out of the sample.

see the models, and in this case, the CCAPM-oil model proved to be a food alternative, and it is even superior to the FF for the data used in this type of test.

7. RISK PREMIUMS INTUITION AND THE SHARPE RATIO

Once demonstrated the superior adjustment of the conditional models over the unconditional ones, it is necessary to analyze how do the risk premiums of those specifications behave and see how they are affected by the inclusion of a conditioning variable.

As it was seen in section 2, the representation of the conditional models through the discount factor is the following:

(7.1)

Developing said expression and knowing that leads to:

(7.2)

Expanding the conditional covariance and rearranging leads to

(7.3)

The term at the left side of the equivalent symbol represents the "conditional" risk premium of the asset adjusted by its volatility, as the hope and volatility are conditioned to the information known in . Said term depends on the free risk rate, the conditional volatility of the stochastic discount factor ( ) and the conditional correlation between the asset and the stochastic discount factor ( ).

7.1. Sharpe Ratio

The expression (7.3) represents the Sharpe Ratio when the asset is the market portfolio. Then, we define

(7.4)

For this case the correlation should be 1 and if it is assumed that the risk free ratio is constant it leads to

(7.5)

Where would be the consumption shocks. It is known that the volatility of the consumption is very small and practically constant, then, it is not a strong assumption to say that is constant. With this, we have that is the only term that makes the conditional Sharpe Ratio change in time. Furthermore, through (3.5) it is known that for the proposed model there is

(7.6)

Where and are constants. This would imply that the condicional Sharpe Ratio depends linearly on the oil shocks. This becomes evident when (7.6) is replaced in (7.5)

(7.7)

Another important point to analyze is if the way in which the oil shocks affect the Sharpe Ratio is in accordance with what has been proposed in other studies. It is agreed that the Sharpe Ratio should be high for recession periods and low (even negative) during economic expansions[10]. Following the calculations that are shown in Appendix B, the value of the constant is obtained for the period of time studied. Considering that both the risk free rate and the volatility of the factor are positive, an idea of what happens with the Sharpe Ratio when there is a positive or negative oil shock can be had. First, assuming that the oil price rises, the term would be positive, which would cause a rise in the Sharpe Ratio. On the other hand, if there is a decrease in the oil price, said term would be negative, which would make the Sharpe Ratio decrease.

But, how can it be known if the Sharpe Ratio is moving in the expected direction? Recalling the results of section 2 of this paper, it can be seen that the rise in oil prices (positive shocks) predicted recessions, and in a certain level, the decreases (negative shocks) anticipated economic expansions. It is because of this that it would be expected for the Sharpe Ratio to increase for positive shocks and to decrease for negative shocks, which is exactly where equation (7.7) leads to.

---

[10] Studies that supported this are Lettau & Ludvigson (2007) and Whitelaw (1997)

Another way of interpreting this is by saying that is the risk aversion[11], then when the oil price rises so does the risk aversion, and when the oil price decreases, the aversion also decreases. This makes sense if one is to think that in recession periods it is expected that people increase their aversion to risk, while in economic expansions the aversion is expected to decrease.

Everything shows the consistency of the proposed model and, at the same time, allows to see in a simple and intuitive way how oil affects the risk premiums and makes them vary in time.

7.1. Beta Analysis

Another point worth analyzing is that the betas associated to the conditional models do not share the same form with the betas of the unconditional models. In the latter, the beta is determined through the simple correlation between the return and a specific factor (be it the market return or the consumption change) in an unconditional form. For the case of the conditional models, this correlation is influenced by the conditional variable which levels it or conditions said value, which allows for beta variables.

Making a parallel with the FF model, it is necessary that the inclusion of a conditioning variable explains the extra premium obtained by stocks with a higher book-to-market ratio. This property would generate from the fact that the value portfolios[12] are riskier than the growth portfolios, but not because of their unconditional correlation with a specified factor as proposed by FF. Rather, its conditional correlation is manifested due to the use of a conditioning variable. The value portfolios are more correlated with a specific factor (consumption growth or market return) when the risk aversion is high (this happens because a bad economic moment is expected due to the high value of the conditioning

---

[11] In Cochrane (2005) it is shown that if a utility function is assumed, the Sharpe Ratio can be approximated as the risk aversion ( ) due to the volatility of consumption.

[12] The value portfolios are those with a high book-to-market ratio while the growth portfolios are those with a low book-to-market ratio.

variable). On the contrary, said portfolios have a lower correlation with this factor when the risk aversion decreases (this occurs because a good economic time is expected due to a low value of the conditioning variable).

To verify the aforementioned, Lettau & Ludvigson (2001b) is followed, where the conditional betas are calculated. To accomplish said calculation, it is necessary to be based on the regression made in the time series done for each portfolio:

, (7.8)

Where is the factor and is the conditioning variable. Replacing this equation in (7.2) leads to an expression for the conditional beta:

(7.9)

As it can be seen in (7.9), the conditional correlation depends directly on the conditioning variable and thus, its value varies in time.

One way of seeing how the betas vary depending on the business cycle is by defining the set of states expected from the economy such as, where . This way, the average conditional beta can be calculated for each of the states:

(7.10)

Where is the average of the conditioning variable for the s state that is expected from the economy. A good economy state is defined as a quarter where the value of the conditioning variable has at least one standard deviation under its median, while a bad state of the economy is understood as a quarter where the conditioning variable has at least one standard deviation above its median.

In Table F.7, the values of the average conditional betas for each portfolio for the models that are used as consumption factors are shown. Furthermore, the average betas of each portfolio for both possible states defined for the economy are also shown. To be able to establish comparisons, the CCAPM betas are added. It is important to note that the latter are constant in time and that they are not an average as in the case of the conditional models.

The data shows an expected pattern that explains, in a certain way the greater risk attributed to the value stocks. In the case of the CCAPM-oil and the CCAPM-cay it happens that for the same size category, the value portfolios have a greater beta than the growth ones when a bad state is expected, effect that is inverted for a good state.

Another effect that should be fulfilled is that value portfolios are more correlated to the consumption when bad times are expected than when good times are expected. This is much clearer for the CCAPM-oil than for the other two. Finally, the contrary would be expected for growth portfolios, that is to say, the betas should be lower when bad times are expected. This effect is better incorporated for the CCAPM-cay and the CCAPM-oilD models.

8. CONCLUSIONS

Continuing with what LL did, in this paper a conditional version of the CAPM and the CCAPM was proposed, but where the conditioning variables are the changes in the oil prices. This decision is made due to this variable being able to anticipate the movements in the economy, allowing the investors to have an idea of what may happen in the future. The question that arises is why do the changes in the oil price are capable of anticipating the economic cycle. The answer to this is simply because the oil price produces important changes at both the macroeconomic and microeconomic levels. These changes are many and range from inflationary pressures that can produce changes in the monetary policy, to the influence over the energy policy of the companies. This makes them a good alternative as a conditioning variable, so models that use it are proposed.

Besides its clear link to the returns, and making a parallel with the LL model, this variable has many advantages over the variable. The reasons point to it being a well known value that has been widely used, that does not suffer of look-ahead bias, and from which monthly or even daily and not just quarterly values can be obtained for .

As for the models proposed in this paper, it could be seen that they do not stay in just solid theoretical grounds, but their empirical application proved extremely successful. The conditional models of the CAPM and the CCAPM proposed achieve adjustments in the cross section that are superior to their unconditional versions. The tests within the sample showed the CAPM model that uses the oil shocks as a conditional as one of the models with the best adjustment, almost matching the achievements of the Fama and French Three Factor Model and well over the conditional model of Lettau and Ludvingson. The flaws in these models when including the industry portfolios suggested by other authors do not appear when including the consumption information of fuel done in this paper. Lastly, the tests out of the sample are clear when they show that the mentioned model is the one with the lowest error of all of them, showing that its implementation in the practice is absolutely viable.

Another point in factor of the proposed conditional CCAPM model is the stability shown in the different tests performed. Its estimated parameters remained significant and did not change much, unlike models such as the Fama and French Three Factor model that many times maintained a high significance and adjustment but obtained unreasonable results (like two high zero-beta rates and changes in the signs of its estimators). On the other hand, the information given by the commodity future is equally significant when used as a conditional.

This paper definitely shows the theoretical and practical effectiveness of the conditional models, but even more important, it rescues oil as a highly important variable in the valuation of assets. It was demonstrated that the influence of the oil shocks – that until now had been analyzed only at a macroeconomic level – can be taken to the microeconomic level where it plays a fundamental role which had not been noticed preciously.

There are several extensions that could be applied to the work done. In this paper, the methodology proposed by Fama & McBeth (1973) has priority mainly due to the structure of the analized data. By using quartely data and by separating the return in 25 portfolios, it is shown that the sample in the time series is small and related to the sample in the cross section. This makes said methodology adjust better to the data than other possibilities, such as the GMM (*generalized method of moments*) methodology of second stage, which needs a longer time series. Anyways, this last one could be applied for data measured at a monthly level.

Another interesting extension is the power to separate the supply shocks from the demand shocks, as their effect on the stocks should be different. On one side, the positive shocks that are attributed to a decrease in the supply should affect the stocks negatively. However, a positive shock due to an increase in the demand means that the companies are demanding more, which would not necessarily have a negative effect on the stocks. By separating these two effects, it could be analyzed which one is stronger and in which way they influence the stock prices. One paper that points in this direction is Kilian (2007).

REFERENCES

Barsky, R. B., & Kilian, L. (2004). Oil and the Macroeconomy Since the 1970's. *Journal of Economic Perspectives* , 18, no. 4, 115-134.

Basu, S. (1977). Investment Performance of Common Stocks in Relation to Their Price-Earning Ratios: A Test of the Efficient Market Hypothesis. *Journal of Finance* , 12, no. 3, 129-156.

Bresnaham, T. F., & Ramey, V. A. (1993). Segments Shifts and Capacity Utilization in the U.S. Automobile Industry. *American Economic Review Papers and Proceedings* , 83, no. 2, 213-218.

Burbidge, J., & Harrison, A. (1984). Testing for the Effects of Oil-Price Rises Using Vector Autoregressions. *International Economic Review* , 25, 459-484.
Campbell, J. Y. (1991). A Variance Decomposition for Stock Returns. *Economic Journal* , 101, 157-179.

Campbell, J. Y., & Shiller, R. J. (1988). The Dividend-Price Ratio and Expectations of Future Dividends and Discount Factors. *Review of Financial Studies* , 1, 195-228.

Carruth, A. A., Hooker, M. A., & Oswald, A. J. (1998). Unemployment Equilibria and Input Prices: Theory and Evidence from the U.S. *Review of Economics and Statistics* , 80, 621-628.

Chen, N.-F., Roll, R., & Ross, S. A. (1986). Economic Forces and the Stock Market. *Journal of Business* , 59, no. 3, 383-403.

Cuñado, J., & Pérez de Gracia, F. (2003). Do Oil Price Shocks Matter? Evidence from Some European Countries. *Energy Economics* , 25, 137-154.

Daniel, B. C. (1997). International Interdependence of Nation Growth Rates: A Structural Trends Analysis. *Journal of Monetary Economics* , 40, 73-96.

Daniel, K., & Titman, S., (2006). Testing Factor-Model Explantions of Market Anomalies. *Working Paper*.

Driesprong, G., Jacobsen, B., Maat, B., (2008). Striking oil: Another puzzle? *Journal of Financial Economics* , 89, 307–327

Fama, E. F., & French, K. R. (1989). Business Conditions and Expected Returns on Stocks and Bonds. *Journal of Financial Economics* , 25, 23-49.

Fama, E. F., & French, K. R. (1993). Common Risk Factors in the Returns on Stock and Bonds. *Journal of Financial Economics* , 33 (1), 3-56.

Fama, E. F., & French, K. R. (1988). Dividend Yields and Expected Stock Returns. *Journal of Financial Economics* , 22, 3-25.

Fama, E. F., & French, K. R. (1996). Multifactor Explanations of Asset Prices Anomalies. *Journal of Finance* , 51, 55-84.

Fama, E. F., & French, K. R. (1992). The Cross-Section of Expected Stock Returns. *Journal of Finance* , 47 (2), 427-465.

Fama, E., & McBeth, J. D. (1973). Risk, Return and Equilibrium: Empirical Tests. *Journal of Political Economy* , 81, 607-636.

Ferderer, J. P. (1996). Oil Price Volatility and the Macroeconomy: A Solution to the Asymmetry Puzzle. *Journal of Macroeconomics* , 18, 1-16.

Ferson, W. E., & Harvey, C. (1999). Conditioning Variables and the Cross Section of Stock Returns. *Journal of Finance* , 54, 1325-1360.

Finn, M. G. (2000). Perfect Competition and the Effects of Energy Price Increases on Economic Activity. *Journal of Money, Credit and Banking* , 32, 400-416.

Finn, M. G. (1995). Variance Properties of Solow's Productivity Residual and their Cyclical Implications. *Journal of Economic Dynamics and Control* , 19, 1249-1281.

Gisser, M., & Goodwin, T. H. (1986). Crude Oil and the Macroeconomy: Test of Some Popular Notions. *Journal of Money, Credit and Banking* , 18, 95-103.

Hamilton, J. D. (1985). Historical Causes of Postwar Oil Shocks and Recessions. *Energy Journal* , 6, 97-116.

Hamilton, J. D. (1983). Oil and the Macroeconomy Since World War II. *Journal of Political Economy, 91* , 228-248.

Hamilton, J. D. (2003). What is an Oil Shock? *Journal of Econometrics* , 113, 363-398.

Hodrick, R. J. (1992). Dividend Yields and Expected Stocks Returns: Alternative Procedures for Inference and Measurement. *Review of Financial Studies* , 5, no. 3, 357-386.

Huang, R. D., Masulis, R. W., & Stoll, H. R. (1996). Energy Shocks and Financial Markets. *Journal of Futures Markets* , 16, 1-27.

Jagannathan, R., & Wang, Z. (1998). An Asymptotic Theory for Estimating Beta-Pricing Models Using Cross-Sectional Regression. *Journal of Finance* , 53, 1285-1309.

Jagannathan, R., & Wang, Z. (1996). The Conditional CAPM and the Cross-Section of Expected Returns. *Journal of Finance* , 51, 3-53.

Jiménez-Rodríguez, R., & Sánchez, M. (2005). Oil Price Shocks and Real GDP Growth: Empirical Evidence for Some OECD Countries. *Applied Economics* , 37 (2), 201-228.

Jones, C. M., & Kaul, G. (1996). Oil and the Stock Markets. *Journal of Finance* , 51, no. 2, 463-491.

Jorgenson, D., & Stiroh, K. (2000). Industry – Level Productivity and Competitiveness between Canada and the United States, U.S. Economic Growth at the Industry Level, *The American Economic Review*, 90, Nº2, 161-167

Kilian, L. (2007). Not All Oil Price Shocks Are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market. *American Economic Review* , forthcoming.

Lee, K., & Ni, S. (2002). On the Dynamic Effects of Oil Price Shocks: A Study Using Industry Level Data. *Journal of Monetary Economics* , 49, 823-852.

Lee, K., Ni, S., & Ratti, R. A. (1995). Oil Shocks and the Macroeconomy: The Role of Price Variability. *Energy Journal* , 16, 39-56.

Lettau, M., & Ludvigson, S. C. (2007). Measuring and Modeling Variation in the Risk-Return Tradeoff. *Forthcoming Handbook of Financial Econometrics* .

Lettau, M., & Ludvigson, S. (2001a). Consumption, Aggregate Wealth, and Expected Stock Returns. *Journal of Finance* , 56, 815-849.

Lettau, M., & Ludvigson, S. (2001b). Resurrecting the (C)CAPM: A Cross-Sectional Test When Risk Premia Are Time-Varying. *Journal of Political Economy* , 109, no. 6, 1238-1284.

Lettau, M., & Ludvigson, S. (2005a). Expected Returns and Expected Dividend Growth. *Journal of Financial Economics* , 76(3), 583-626.

Lewellen, J., & Nagel, S. (2006). The Conditional CAPM does not Explain Asset-Pricing Anomalies. *Journal of Financial Economics* , 82, 289-314.
Lewellen, J., Nagel, S., & Shanken, J. (2008). A Skeptical Appraisal of Asset-Pricing Tests. *NBER, Working Paper* .

Lustig, H., & Van Nieuwerburgh, S. (2004). Housing collateral, consumption insurance, and risk premia. *Journal of Finance* , 60(3), 1167-1221.

Mork, K. A., Olsen, O., & Mysen, H. T. (1994). Macroeconomic Responses to Oil Price Increases and Decreases in Seven OECD Countries. *Energy Journal* , 15, no. 4, 19-35.

Nanda, M., & Faff, R. (2008). Does Oil Move Equity Prices? A Global View. *Energy Economics* , 30, 986-997.

Raymond, J. E., & Rich, R. W. (1997). Oil and the Macroeconomy: A Markov State-Switching Approach. *Journal of Money, Credit and Banking* , 29, 193-213. Erratum 29 (November, Part 1), 555.

Rotemberg, J. J., & Woodford, M. (1996). Imperfect Competition and the Effects of Energy Prices Increases. *Journal of Money, Credit and Banking* , 28, no. 4 (part 1), 549-577.

Sadorsky, P. (1999). Oil Price Shocks and Stock Market Activity. *Energy Economics* , 21, 449-469.

Santini, D. J. (1985). The Energy-Squeeze Model: Energy Price Dynamics in the U.S. Business Cycles. *International Journal of Energy Systems* , 5, 18-25.

Santos, T., & Varonesi, P. (2006). Labor income and predictable stock returns. *Review of Financial Studies* , 19, 1-44.

Shanken, J. (1992). On the Estimation of Beta-Pricing Models. *Review of Financial Studies* , 5, no. 1, 1-33.

Stambaugh, R. F. (1982). On the Exclusion of Assets From Tests of the Two-Parameter Model: A Sensitivity Analysis. *Journal of Financial Economics* , 10, no. 3, 237-268.

Tobin, J. (1958). Liquidity Preference as Behavior Towards Risk. *Review of Economic Studies* , 25(2), 65-86.

Whitelaw, R. F. (1997). Time Varying Sharpe Ratios and Market Timing. *Working Paper, New York University* .

Wooldridge, J. (2002). *Introductory Econometrics*. Michigan State University.

Zhang, L. (2005). The Value Premium. *Journal of Finance* , 60(1), 67-103.

APPENDIX A: DATA AND METHODOLOGY USED

In this section, the data handed to calibrate the different models and the different sources where this information was obtained are shown. Furthermore, a short explanation of the Fama & MacBeth (1973) methodology is made, which is the one used to calibrate said models. Finally, the criteria that will be used to consider which model is better and under what justification is shown.

A.1 - Data used and Information Sources

The period of time that was considered to prove the proposed model goes from the first quarter of 1966 to the fourth quarter of (1966:I a 2006:IV), which adds a total of 164 observations in the time series. The fact of taking quarterly and not monthly data as an example was mainly due to being able to compare with the models that can only be calibrated quarterly (like the LL) and due to the predictability of the oil shocks in the macroeconomy being associated with quarterly periods of time. The data range that will be used justifies why in it a significant quantity of data can be extracted and why the more recent effect of the oil will be analyzed. Furthermore, with the aim of comparing the proposed model, it was necessary to adjust the data range according to the availability of some of the variables (an example would be the variable).

The return data is grouped in 25 portfolios, just as in Fama & French (1992) and Fama & French (1993), which correspond to the *value weighted* returns of the intersection between five portfolios sorted by size and five portfolios sorted by their book-to-market ratio. The portfolios were created using CRSP data from December 17th and their construction was done at the end of June. This data, along with the market returns and the free risk rate were taken from Professor Kenneth French webpage[13].

The oil price used is the Producer Price Index of the crude oil (domestic production) not seasonally adjusted, that corresponds to the WPU0561 series in the *Bureau of Labor*

[13] (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/)

Statistics[14] webpage. The variable data were taken from Professor Sydney Ludvigson[15] webpage, and for more information on the calculation of said variable, it is recommended to see Lettau & Ludvigson (2001a).

The consumption data that was considered were those of the nondurable goods and the service goods. Said data is available in the webpage of the *Bureau of Economic Analysis*[16], BEA (Tables 2.8.3, 2.8.4, 2.8.5 and 2.8.6 of the NIPA tables). The GDP data is in Table 1.1.6 of the BEA. All this data was measured in real terms. The tendency to avoid spurious regressions is extracted from the oil data series and the data series.

Table A.1: Correlations between the utilized variables

	Market	Consumption	HML	SMB	cay_des1	oil	oil_des1	oil_des4
Market	1,000	0,146	-0,471	0,487	0,232	-0,224	0,021	-0,148
Consumption	0,146	1,000	0,001	0,059	-0,201	-0,084	-0,203	-0,132
HML	-0,471	0,001	1,000	-0,189	-0,135	0,077	-0,146	0,149
SMB	0,487	0,059	-0,189	1,000	0,019	-0,103	0,054	0,071
cay_des1	0,232	-0,201	-0,135	0,019	1,000	-0,172	-0,081	-0,086
oil	-0,224	-0,084	0,077	-0,103	-0,172	1,000	-0,026	0,069
oil_des1	0,021	-0,203	-0,146	0,054	-0,081	-0,026	1,000	0,105
oil_des4	-0,148	-0,132	0,149	0,071	-0,086	0,069	0,105	1,000

Note.- The table shows the correlations between the variables used in this paper. The Market variable refers to the quarterly market return by over one risk free asset, Consumption refers to the logarithmic changes in the consumption, SMB and HML are portfolios elaborated by Fama and French that are related to the size and book-to-market ratio of one company respectively, the cay variable is a variable associated to the consumption welfare ratio that was implemented by LL and oil has to do with the oil shocks. When a variable is followed by a dash and then the word "des" accompanied by a number, it refers to the number of quarters in which the variable is lagged.

[14] (http://stats.bls.gov/ppi/home.htm#data)

[15] (http://www.econ.nyu.edu/user/ludvigsons/)

[16] (http://www.bea.gov/national/nipaweb/SelectTable.asp?Selected=N)

With the aim of being the relationship between the different variables used in this paper, a correlation matrix is shown in Table 5.1. As it can be seen, the correlations are generally quite low. This is important as it would point to the different factors will contribute new information to the models.

Analyzing in detail the variables that have to do with the oil shocks, it can be seen that they do not have a high correlation with any of the other variables. This indicates that a good adjustment of the models that use the changes in oil prices in their specification would not occur due to its correlation with the variables commonly used in the literature, but rather, there would be a contribution of new information that allows to value in a better way the return of the shares.

A.2 - Estimation Methodology

The methodology used to estimate the ’s and the risk price ( ) for each of the models analyzed is the one proposed by Fama & MacBeth (1973), which consists of two stages. In the first one, a regression in the time series with the returns and the factors is run to obtain the ’s of each of the stock (n time series).

, (A.1)

Where is the return in of the portfolio, is the regression intercept (that should be 0), has to do with the “risk free rate” or portfolio with a zero beta, is a vector with the factors, is a vector with the of each factor and is the error. Applying hope to the equation shown before it leads to:

(A.2)

Which shows that the returns are linear in the ’s. In the original methodology, the ’s were calculated every five years (*rolling betas*), but it was later shown that only one can be calculated for the whole simple, which is what was used in this paper.

In the second stage, regressions are run in the cross section so as to find an estimator for the risk premiums. The regressions are of the form

, (A.3)

Where is the risk premium vector and is the error. Regressions are run for every instant of time, to later find the following estimators for and :

– , – (A.4)

The Standard deviations of the estimators are the following

— — (A.5)

will definetly be the estimator for the risk premiums and is used to test that the errors in valuation are zero.

This methodology does not consider the ’s calculated in the first stage to be an estimation, which should influence the calculation of the standard errors. To correct this, corrected errors proposed by Shanken (1992) must be calculated. This correction was elaborated when the betas were calculated every certain amount of data in the *rolling betas*. In the case in which one beta is calculated for a whole sample, the correction that must be done is the one proposed in Jagannathan & Wang (1996).

APPENDIX B: RELATIONSHIP BETWEEN THE STOCHASTIC DISCOUNT FACTOR CONSTANTS AND THE BETA REPRESENTATION

According with the exhibited in section 2 of this paper, the asset valuation models can be expressed in their discount factor representation or in their beta representation. The representation through the discount factor of the conditional models is the following:

(B.1)

Where is the return in and is the factor that the model uses. Using the equations (2.11), it leads to:

(B.2)

Applying unconditional hope to the expression shown before and developing it leads to the following equation

(B.3)

Where

On the other hand, the estimators obtained when the Fama-MacBeth methodology is applied are the ’s and ’s that appear in the beta representation proposed in equation (2.12). Equalling the two expressions can lead to a direct relationship between the and [17]constants

[17] En la ecuación (2.12) aparece en vez de , esto es porque es un ejemplo de un factor. En definitiva es equivalente referirse a o , sin embargo hablar de es más general.

(B.4)

Clearing in the other direction:

(B.5)

With which these two representations are connected.

APPENDIX C: INDUSTRY WEIGHT VARIABLE

To represent the weight of each industry in the model, it was decided to incorporate the consumption possessed by the oil. The information provided by the EIA[18] a proxy of the commodity given by the consumption of fuel. Given that for some industries, the consumption is quite larger than for others, it was decided to correct by net sales so as to use the proportion of the fuel consumption with respect to the latter. This ratio or proportion was assumed constant during the whole period of time and is delivered directly by the EIA as the *Consumption per dollar of value of shipment* (BTU). That is to say, the consumption directly corrected by the value of shipment which is a net sales proxy of all products.

The consumption shown by EIA do not correspond exactly to the industries specified by French. The relationship between the weights defined by the EIA and the Fama industries is shown in table C.1. Given that the information regarding all the industries defined by French was not at hand, 21 out of the 30 industries were selected for the modelling. In the same table, the value logarithms are shown so as to flatten the extreme amounts which were used for the modelling.

[18] http://www.eia.doe.gov/emeu/mecs/

Table C.1: Weight assigned to the different industries

	Industry portfolios defined by Fama-French	Consumption (Trillion Btu)	Net Sales (billions USS)	Consumption/Sales ratio (miles BTU)	Ln(ratio)	EIA definition of industry
1	Food: Food Products	1116	429	2,6	0,96	Food
2	Beer: Beer & Liquor	85	65	1,3	0,26	Beverage
3	Smoke: Tobacco Products	19	38	0,5	-0,69	Tobacco Products
5	Books: Printing and Publishing	98	89	1,1	0,10	Printing and Related Support
6	Hshld Consumer Goods	7	6	1,1	0,10	Leather and Allied Products
7	Clths: Apparel	30	33	0,9	-0,11	Apparel
9	Chems: Chemicals	3769	443	8,5	2,14	Chemicals
10	Txtls: Textiles	205	48	4,3	1,46	Textile Mills
11	Cnstr: Construction and Construction Materials	375	89	4,2	1,44	Wood Products
12	Steel: Steel Works Etc	2123	150	14,2	2,65	Primary Metals
13	FabPr: Fabricated Products and Machinery	562	478	1,2	0,18	Fabricated Metal Products + Machinery
14	ElcEq: Electrical Equipment	103	103	1	0,00	Electrical Equip., Appliances, and Components
15	Autos: Automobiles and Trucks	424	606	0,7	-0,36	Transportation Equipment
16	Carry: Aircraft, ships, and railroad equipment	424	606	0,7	-0,36	Transportation Equipment
17	Mines: Precious Metals, Non-Metallic, and Industrial Metal Mining	1052	90	11,7	2,46	Nonmetallic Mineral Products
18	Coal: Coal	34	2	17,5	2,86	Coal Products
19	Oil: Petroleum and Natural Gas	3086	192	16,1	2,78	Petroleum Products
23	BusEq: Business Equipment	200	400	0,5	-0,69	Computer and Electronic Products
24	Paper: Business Supplies and Shipping Containers	2361	155	15,2	2,72	Paper
26	Whlsl: Wholesale	63	70	0,9	-0,11	Furniture and Related Products
27	Rtail: Retail	63	70	0,9	-0,11	Furniture and Related Products

APPENDIX D: DATA USED FOR VALIDATION

The data that will be used for conducting this test is the same that the one used for the sections before. In the first instance, the time window that goes from the first quarter of 1966 to the fourth quarter of 2001 will be used to calibrate and then predict the returns for the first quarter of 2002. Then, the data ranking from the first quarter of 1966 to the first quarter of 2002 will be used to calibrate and then predict the returns of the second quarter of 2002. This continues on until the last calibration window is made which goes from the first quarter of 1966 to the third quarter of 2006 and is then used to predict the returns of the fourth quarter of 2006.

APPENDIX E: METHODOLOGY FOR VALIDATION

The proposed methodology can be divided in a certain number of steps which are detailed here:

Step 1: The models are calibrated with the corresponding data, with which the estimators for the betas, lambdas and zero beta rate are obtained.

Step 2: With the coefficients found, the stochastic discount factor constants are calculated as shown in appendix B.

Step 3: With the value of said constants, the return estimations for the next period can be done if the values of the factors for that period of time are known[19] and it is assumed that the ’s will remain constant. How to find the lambda of the beta representation starting from the stochastic discount factor constants is shown in detail in appendix B.

Step 4: The returns calculated are compared to the real returns and a term of error is obtained.

Step 5: One last piece of information is added to the set that is used to calibrate and one returns to step 1.

This process is repeated until all the observations have been included, that is to say, until the fourth quarter of 2006.

[19] In the case of the factors this value is unknown, then the historical average which is the best estimation for the next period is taken.

Table F.1: Fama-MacBeth Procedure for conditional and unconditional models

		Factor				Conditioning Variable			Cross Term (Factor · Conditioning Variable)					
Model	Const.													
CCAPM	2,23%		0,48%											0,165
	(3,02)		(1,74)											(0,130)
	(1,96)		(1,14)											0,001
APT	2,57%		0,48%				-11,87%							0,335
	(3,37)		(1,71)				(-2,24)							(0,278)
	(1,81)		(0,92)				(-1,21)							0,006
FF	4,64%	-1,69%		0,74%	1,40%									0,793
	(3,66)	(-1,17)		(1,57)	(2,93)									(0,765)
	(3,46)	(-1,11)		(1,47)	(2,88)									0,201
CCAPM-	5,88%		-0,37%			*					0,01%			0,594
Cay	(5,50)		(-1,28)								(3,68)			(0,559)
	(3,61)		(-0,84)								(2,42)			0,114
CAPM-oil	2,54%	0,83%					-9,23%		-1,06%					0,581
	(2,31)	(0,63)					(-1,81)		(-4,09)					(0,524)
	(1,53)	(0,42)					(-1,21)		(-2,73)					0,036
CAPM-oilD	3,75%	-0,82%						13,83%		1,38%				0,594
	(4,26)	(-0,75)						(3,44)		(3,17)				(0,538)
	(2,80)	(-0,50)						(2,26)		(2,09)				0,031
CCAPM-oil	4,49%		-0,34%				*					0,11%		0,678
	(5,26)		(-1,01)									(3,77)		(0,650)
	(2,97)		(-0,57)									(2,13)		0,107
CCAPM-oilD	3,27%		0,41%					13,09%					0,12%	0,650
	(4,51)		(1,70)					(2,77)					(3,06)	(0,602)
	(1,86)		(0,70)					(1,16)					(1,28)	0,010

Note.- The table shows estimations using the data specified in Appendix A. Under each of this estimetations the corrected and uncorrected t-tests are presented in the parenthesis. The term is the return in of the market portfolio over the risk rate, is the logarithmic change of consumption for the period , SMB y HML are the portfolios elaborated by Fama and French that are related to the size and the book-to-market ratio of a company respectively and are the oil shocks for an x period of time. Los terms and refer to the stadistic and adjusted that is obtained by running a regresión in the cross section using OLS *(Ordinary Least Square)*. The term refers to the stadistic that is obtained by running a regresión in the cross section using GLS *(General Least Square).* The variable is a variable associated to the welfare consumption ratio that is implemented by LL. The cross term refers to the multiplication of the factor by the corresponding conditioning variable. *Value omitted in the second stage of the Fama-MacBeth methodology.

Table F.2: Fama-MacBeth Procedure including the industries portfolios

						Conditioning								
		Factor				Variable		Cross Term		Industry Weight				
Model	Const.									Const				
APT	3,95%		-0,12%				-0,80%							0,037
	(6,34)		(-0,72)				(-0,25)							(-0,007)
	(6,03)		(-0,68)				(-0,24)							
FF	4,52%	-1,51%		0,56%	1,08%									0,42
	(3,77)	(-1,12)		(1,17)	(2,20)									(0,379)
	(3,62)	(-1,07)		(1,12)	(2,12)									
CCAPM-cay	4,87%		-0,38%			0,45%		0,01%						0,23
	(6,16)		(-3,03)			(0,89)		(1,71)						(0,176)
	(4,03)		(-1,98)			(0,59)		(1,12)						
CCAPM-oil	3,80%		-0,08%				-2,02%		0,04%					0,33
	(6,09)		(-0,44)				(-0,61)		(1,74)					(0,283)
	(4,80)		(-0,35)				(-0,48)		(1,37)					
CCAPM	3,61%		0,02%				-3,72%		0,05%	*	*	-0,07%	-0,04%	0,57
oil-ind	(6,06)		(0,11)				(-1,12)		(2,05)			(-1,99)	(-2,77)	(0,508)
	(4,31)		(0,08)				(-0,80)		(1,46)			(-1,41)	(-1,97)	

Note.- See note in Table F.1. The weight of the industry is defined in appendix C.

* Value omitted in the second stage of the Fama-MacBeth methodology.

Table F.3: Fama-MacBeth Procedure for conditional and unconditional models including the future as a factor

Model	Const.	Factor		Conditioning Variable			Cross Term			Cross Term			
CAPM-oil	4,48%	-0,88%		-3,49%			-0,66%						0,54
	(3,18)	(-0,53)		(-0,57)			(-1,75)						(0,48)
	(2,86)	(-0,48)		(-0,51)			(-1,57)						
CAPM-oilD	5,74%	-2,26%			7,97%			0,05%					0,49
	(4,63)	(-1,54)			(1,10)			(0,09)					(0,420)
	(4,03)	(-1,34)			(0,96)			(0,08)					
CAPM-oilF	4,85%	-1,29%				3,19%			0,56%				0,49
	(3,68)	(-0,83)				(0,53)			(1,28)				(0,421)
	(3,38)	(-0,76)				(0,49)			(1,17)				
CCAPM-oil	3,76%		0,09%	-9,20%						0,00%			0,42
	(4,64)		(0,51)	(-1,36)						(-0,06)			(0,337)
	(3,90)		(0,43)	(-1,14)						(-0,05)			
CCAPM-oilD	4,16%		0,21%		6,04%						0,08%		0,51
	(3,83)		(1,01)		(1,17)						(1,75)		(0,442)
	(2,72)		(0,71)		(0,83)						(1,24)		
CCAPM-oilF	3,10%		0,31%			1,80%						-0,03%	0,34
	(3,37)		(1,31)			(0,36)						(-0,71)	(0,250)
	(2,41)		(0,94)			(0,26)						(-0,51)	

Note.- See note of Table F.1.
* Value omitted in the second stage of the Fama-MacBeth methodology

Table F.4: Residual effect of size

		Factor				Conditioning Variable			Cross Term		Cross Term				
Model	Const.													Size	
FF	7,59%	-1,63%		-0,47%	1,16%									-0,33%	0,82
	(4,12)	-1,12		-0,56	2,37									-1,90	0,78
	(4,02)	-1,09		-0,55	2,31									-1,86	0,25
CCAPM-cay	6,36%		-0,41%			*					0,01%			-0,06%	0,602
	(4,91)		(-1,86)								(2,51)			(-0,40)	(0,567)
	(3,19)		(-1,21)								(1,63)			(-0,26)	0,239
CAPM-oil	9,16	-2,44%					-1,80%		-0,24%					-0,41%	0,817
	(4,79)	(-1,91)					(-0,44)		(-1,30)					(-3,27)	(0,772)
	(4,51)	(-1,80)					(-0,42)		(-1,22)					(-3,07)	0,217
CAPM-oilD	13,36%	-3,96%						-7,31%		-0,71%				-0,69%	0,836
	(7,09)	(-3,53)						(-2,02)		(-2,14)				(-4,90)	(0,795)
	(5,51)	(-2,75)						(-1,57)		(-1,66)				(-3,81)	0,310
CCAPM-oil	4,39%		-0,33%				*					0,10%		0,01%	0,678
	(2,88)		(-1,52)									(2,48)		(0,06)	(0,650)
	(1,62)		(-0,85)									(1,39)		(0,03)	0,199
CCAPM-oilD	3,90%		0,32%					12,42%					0,11%	-0,06%	0,659
	(2,33)		(1,98)					(2,11)					(2,32)	(-0,37)	(0,574)
	(1,35)		(1,15)					(1,23)					(1,35)	(-0,21)	0,192

Note.- Se note under Tabla F.1. The size variable refers to the coefficient that accompanies the size logarithm (variable) in the second stage of the Fama-MacBeth procedure.

* Value omitted in the second stage of the Fama-MacBeth methodology.

Table F.5: Residual effect of the book-to-market ratio

Model	Const.	Factor				Conditioning Variable			Cross Term		Cross Term			Book-to-market ratio	
FF	5,33%	-1,87%		0,69%	0,39%									0,68%	0,808
	(4,08)	(-1,29)		(1,47)	(0,46)									(1,51)	(0,760)
	(3,86)	(-1,22)		(1,40)	(0,44)									(1,43)	(0,417)
CCAPM-cay	4,64%		-0,09%			*					0,005%			0,66%	0,754
	(5,83)		(-0,57)								(2,15)			(1,65)	(0,733)
	(5,19)		(-0,51)								(1,91)			(1,47)	0,393
CAPM-oil	2,57%	1,14%					4,46%		-0,62%					1,08%	0,858
	(2,34)	(0,85)					(1,12)		(-3,15)					(3,41)	(0,822)
	(1,89)	(0,69)					(0,90)		(-2,54)					(2,75)	0,369
CAPM-oilD	2,73%	0,82%						6,46%		0,12%				1,04%	0,788
	(2,88)	(0,68)						(1,97)		(0,41)				(3,53)	(0,735)
	(2,55)	(0,60)						(1,74)		(0,37)				(3,11)	0,371
CCAPM-oil	3,88%		-0,07%				*					0,07%		0,54%	0,795
	(5,35)		(-0,31)									(2,21)		(1,58)	(0,777)
	(4,16)		(-0,24)									(1,71)		(1,22)	0,364
CCAPM-oilD	3,32%		0,34%					7,64%					0,07%	0,48%	0,737
	(4,52)		(1,26)					(2,15)					(2,73)	(1,27)	(0,671)
	(2,98)		(0,84)					(1,42)					(1,81)	(0,84)	0,337

Note.- See note under Table F.1. The book-to-market ratio refers to the coefficient that accompanies that the logarithm of the book-to-market ratio (variable) in the second stage of the procedure.
* Value omitted in the second stage of the Fama-MacBeth methodology

Table F.6: Validation: Out-of-sample proof

Date out of the Sample	Mean Square Error				R^2			
	FF	CCAPM-cay	CCAPM-oil	CCAPM-oilD	FF	CCAPM-cay	CCAPM-oil	CCAPM-oilD
Q1-2002	9,8	18,5	14,6	476,7	0,463	0,165	0,362	0,477
Q2-2002	6,4	13,2	10,5	356,2	0,360	0,272	0,428	0,356
Q3-2002	6,1	6,9	6,3	87,2	0,152	0,280	0,268	0,087
Q4-2002	2,5	4,4	2,7	89,2	0,090	0,005	0,063	0,089
Q1-2003	24,7	40,4	28,4	59,2	0,059	0,004	0,018	0,059
Q2-2003	3,8	3,3	3,8	35,9	0,102	0,230	0,160	0,036
Q3-2003	148,4	184,7	143,1	70,9	0,215	0,371	0,435	0,071
Q4-2003	3,0	2,6	3,4	469,7	0,588	0,250	0,448	0,470
Q1-2004	49,6	59,2	45,8	260,1	0,359	0,282	0,456	0,260
Q2-2004	63,2	79,7	53,2	2,4	0,000	0,020	0,019	0,002
Q3-2004	19,7	26,5	17,7	142,1	0,129	0,013	0,039	0,142
Q4-2004	2,9	2,2	3,1	77,8	0,126	0,169	0,255	0,078
Q1-2005	60,1	89,8	58,3	11,3	0,027	0,002	0,000	0,011
Q2-2005	32,7	49,6	33,8	83,1	0,142	0,101	0,148	0,083
Q3-2005	5,4	9,1	5,8	134,7	0,139	0,229	0,133	0,135
Q4-2005	27,0	44,7	29,3	76,5	0,166	0,082	0,063	0,077
Q1-2006	3,5	4,6	3,6	160,3	0,197	0,354	0,302	0,160
Q2-2006	49,7	74,6	49,5	22,7	0,062	0,001	0,001	0,023
Q3-2006	74,8	114,5	72,9	67,4	0,045	0,089	0,152	0,067
Q4-2006	2,1	1,8	2,2	312,7	0,539	0,328	0,388	0,313
Average	29,8	41,5	29,4	149,8	0,198	0,162	0,207	0,150

Table F.7: Condicional Betas

Portfolio		CCAPM	CCAPM-cay			CCAPM-oil			CCAPM-oilD		
			All Status	Good Status	Bad Status	All Status	Good Status	Bad Status	All Status	Good Status	Bad Status
	B1	3.82	4.94	5.05	4.83	4.44	2.91	5.97	3.91	9.07	-1.27
	B2	4.32	5.49	4.41	6.63	4.58	1.89	7.27	4.52	8.69	0.33
S1	B3	3.56	4.56	3.73	5.43	3.53	0.27	6.80	3.78	7.61	-0.06
	B4	3.84	4.82	3.71	5.98	3.77	0.63	6.92	4.09	7.88	0.28
	B5	4.08	5.15	3.46	6.93	3.77	0.16	7.39	4.39	10.12	-1.35
	B1	3.53	4.80	7.57	1.89	4.20	3.73	4.66	3.41	6.48	0.34
	B2	2.89	3.93	4.30	3.54	3.18	1.64	4.72	3.08	7.17	-1.02
S2	B3	3.28	4.25	5.24	3.21	3.41	1.73	5.10	3.36	5.04	1.68
	B4	3.27	4.37	4.10	4.65	3.18	0.85	5.51	3.59	6.91	0.26
	B5	4.06	4.88	5.43	4.30	3.81	0.21	7.41	4.22	6.58	1.86
	B1	2.76	3.99	8.51	-0.75	3.50	5.42	1.58	2.49	4.43	0.55
	B2	2.96	3.98	5.86	2.02	3.22	2.26	4.19	3.01	5.91	0.10
S3	B3	2.82	3.81	4.39	3.20	2.79	1.60	3.97	2.96	5.55	0.36
	B4	2.68	3.57	5.59	1.46	2.72	1.32	4.12	2.74	3.85	1.62
	B5	3.06	3.81	4.92	2.66	2.94	1.18	4.70	3.34	7.16	-0.50
	B1	2.11	3.15	7.28	-1.17	2.85	3.74	1.97	1.73	2.92	0.54
	B2	3.06	4.01	7.42	0.43	3.27	2.62	3.93	3.12	5.99	0.25
S4	B3	2.15	2.90	5.22	0.47	2.26	1.48	3.04	2.21	4.50	-0.08
	B4	2.19	2.82	5.47	0.04	2.39	2.08	2.70	2.32	3.63	1.00
	B5	3.06	3.91	5.11	2.66	3.43	3.01	3.86	3.04	5.32	0.75
	B1	2.73	3.70	8.21	-1.02	3.31	6.80	-0.19	2.45	5.22	-0.32
	B2	2.40	3.32	6.51	-0.02	2.56	2.98	2.15	2.22	4.66	-0.24
S5	B3	2.88	3.66	7.19	-0.04	2.96	3.83	2.08	2.91	5.93	-0.12
	B4	2.14	2.82	6.45	-0.97	2.26	3.31	1.21	2.33	6.25	-1.61
	B5	3.61	4.44	6.08	2.72	3.39	3.93	2.84	3.45	5.89	1.00

Note.- The table shows estimations for following the Fama-MacBeth methodology.