DOES THE SHADOW OF POLITICAL RISK FALL ON ASSET PRICES?
Oily Evidence*

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ABSTRACT

In the oil sector, emerging economies appear to be moving in the opposite direction from that assumed in the conventional wisdom on their integration into the world economy – as oil prices have soared, institutions such as regulatory stability, and contract sanctity and enforcement appear to be in decline, while political risk appears to be increasing. Does institutional deterioration harm the value of the very natural resources on which these countries depend?

This paper investigates the effect of political risk on the value of real assets – here petroleum (crude oil and natural gas) reserves – associated with the country in which the reserves are located. We utilize a global transactions database of 1,655 mergers and acquisitions in which petroleum reserves were traded during the period 2000-2006. To capture the riskiness of the location, we consider the political risk rating calculated by International Country Risk Guide (ICRG) and the country risk rating published in *Institutional Investor*. Controlling for factors that affect reserve value, we demonstrate the value-destruction of political risk, and estimate the asset discount for 37 countries. Furthermore, contrary to the assumption in the scholarly literature, we show that the discount depends on market conditions – the higher the expected future market prices of oil and gas, the larger is the discount, regardless of a country's riskiness. Our findings suggest that treating political risk and market risk separately is likely to yield inaccurate estimates of asset value. The results are salient for evaluating investment opportunities in industries where political risk depends on world markets.

I. Introduction

“The big theme of the oil and gas business in 2006 was resource nationalism … host countries find that oil market forces have shifted in their favor, enabling them to advance their interests much more effectively.” ***PIW*** (2007a).

“International oil companies can invoke the sanctity of contracts and may even prevail in arbitration, but they risk losing access to resources if they upset their hosts.” ***PIW*** (2007b).

"There is no such thing in the [Petroleum] E[xploration] & P[roduction] business as a contract that is not renegotiated." John Browne, CEO of British Petroleum, quoted in ***PIW*** (2007b).

Petroleum is a global industry, and accounts of the largest single component of international trade. Developing countries have made headlines on energy issues, ranging from competition by India and China for supplies to fuel their rapidly-developing economies to the “resource nationalism” of oil-exporting countries. In one critical dimension, however, emerging economies appear to be moving in the opposite direction from that assumed in the conventional wisdom on their integration into the world economy – as oil prices have soared, institutions such as regulatory stability, and contract sanctity and enforcement appear to be in decline, while political risk appears to be increasing.

How do these institutional changes affect the ways in which MNC’s do business in oil countries? As a prelude to research on the evolving relationship between MNEs and host governments in this industry, it is important to get a sense of the consequences of the changing landscape. The market may exact a price for institutional deterioration – the value of the very resources on which oil-rich (and more generally, natural-resource-rich) countries depend may be destroyed as a consequence of political risk.

This paper has two goals. The first is to operationalize political risk in the context of natural resources, focusing on petroleum. What is the cost of political risk? Can it be measured, and if so, how? Can we determine how long a shadow it casts on natural-resource asset prices in risky countries? The answers to these questions are of interest to MNCs considering investment abroad or managing existing foreign investments, to investors and analysts who follow MNC securities, and to government policymakers in resource-rich who seek to influence the level of investment.

Our second goal is to influence the research literature on political risk. While scholars tend to write about the costs of political or country risk conceptually, this paper approaches the question empirically. The paper draws on a dataset of transactions in which assets located in different political jurisdictions are traded. Specifically, we utilize a database reflecting market trading in reserves of oil and/or gas. The market value of the exchange is known, and we investigate the determinants of value in order to ascertain whether the risk characteristics of the location are important. The investigation allows us to calculate the amount by which the asset is discounted for the political or country risk. The research is noteworthy because, to our knowledge, there has not been a serious attempt to measure the cost of political or country risk using market prices of assets.

Moreover, the existing literature tends to treat political risk and market risk separately. The quotes above on resource nationalism suggest that in practice politics and markets may be closely related. Volatile prices may exacerbate political risk during booms and mitigate it during busts. We demonstrate how to address such interaction, and implement statistical tests to determine if it is significant in the petroleum industry. Our findings indicate that it is, suggesting that treating political risk and market risk separately in valuation of petroleum reserves is likely to yield inaccurate estimates of asset value.

The total risk of an investment consists of many elements. Part of the risk can be explained by market risks at large, including fluctuations in the output price and the factor input prices, as well as changes in the quantity of output, perhaps associated with the business cycle. Another part of the total risk is associated with financial risks, such as exchange rate, interest rate, and inflation risks. However, part of the total risk also consists of political risks arising from characteristics of the specific jurisdiction in which operations take place. Together, the market, financial, and political risks are conventionally referred to as “country risk.” Thus, political risk is a narrower concept than country risk, although the terms are often loosely used interchangeably, somewhat in recognition of the high correlation between the two variables.

Some analyses of the effects of political or country risk on other variables already exits. Most previous literature in this area considers the effects of political/country risk on macroeconomic aggregates, such as growth. Campos and Nugent (2002) point out that the negative impact of political risk on economic growth is now regarded as a “stylized fact” (p. 158). Some previous empirical work has considered the pricing of sovereign bonds, but this involves an assessment of the riskiness of the borrower rather than the riskiness of the asset location. Other previous empirical work examines the effect of political or country risk on (aggregate) stock market returns. For example, several studies suggest that stock returns are higher in countries with more political/country risk and within a country during periods with more risk: see Diamonte, Liew, and Stevens (1996), Erb, Harvey, and Viskanta (1996), and

Bilson, Brailsford, and Hooper (2002). However, these do not directly consider the pricing of assets and cannot arrive at an estimate of an asset discount.

We focus our attention on prices for oil and/or gas reserves because value is clearly tied to the jurisdictional location of the asset. The value of the output is more or less identical across locations, as a barrel of oil is essentially a homogeneous commodity. Hence, the value of the reserves will vary across locations primarily because of differences in the costs for extracting them and differences in jurisdictional treatment. Controlling for the type of reserve (e.g., conventional versus coalbed methane versus heavy oil, and so on) likely controls for the differences in the costs of extraction. Hence, any differences associated with political jurisdictions must be associated with political and/or country risk.

Many analysts produce ratings of country and/or political risk by country through time. (For a survey, see Howell, 2001.) In this paper, we use the political risk index distributed by the International Country Risk Guide (ICRG) and the country risk index published in *Institutional Investor* magazine. As ratings are positively correlated, we consider these as broadly representative of the indices available. The ratings are used as determinants of the value of oil/gas reserves on a per unit basis in regressions controlling for the prices of oil and gas, the type of oil/gas reserve, and the mix of oil and gas. Results demonstrate that the value of reserves per barrel-of-oil-equivalent (boe) depends on these political and country risk ratings. We are thus able to calculate the asset discount for the 37 countries in our sample relative to the U.S. For example, reserves in Russia trade at a 58% discount (using ICRG) or a 74% discount (using *Institutional Investor*) compared to what they would fetch if they were in the U.S. The magnitude of these findings suggests that the topic warrants further investigation.

In one extension of the work, we find evidence that the discount for political/country risk depends on the prices of oil and gas, such that the discount is low [high] when the price of oil/gas is low [high]. Using the ICRG data, we consider low and high prices of $25 and $40 per barrel, respectively. If the price of oil is $25 per barrel, the discount on reserves in Russia is just 49%. However, when the price of oil is $40 per barrel, the discount on reserves in Russia is up to 86%. Using *Institutional Investor* data, the estimates are much higher but less variable. If the price of oil is $25 per barrel, the discount on reserves in Russia is 164%, and when the price of oil is $40 per barrel, the discount on reserves in Russia is up to 188%. The finding that the discount for political/country risk depends on the prices of oil and gas is an important insight for political and country risk assessment because most ratings are constructed with other determinants in mind; see, for example, Cosset and Roy (1991).

II. Political Risk and the International Petroleum Industry

"We are not against foreign investment. But we are against attempts to make us look like a banana republic." Oleg Mitvol (head of Russia's state environment agency), quoted in Osborn and Harrison (2006).

"In less than three years of exploitation, the consortium has earned $5bn for a $3bn investment. In contrast, Chad has just received crumbs: $588m." Idriss Deby (president of Chad), quoted in Reuters (2006).

A confluence of factors makes the international petroleum industry a propitious arena for examining political risk. First, political risk is probably more important in this industry than any other. Indeed, natural resource industries, of which petroleum is the largest, have accounted for the largest number of expropriations of foreign direct investment (FDI) (Kobrin 1980, 1984, 1985). The first major nationalizations of foreign multinationals took place in the petroleum industry in Bolivia and Mexico in the 1930s. This is in part due to the large rent component in natural-resource prices, and in part due to beliefs that natural resources are a country's national patrimony. Indeed, some countries do not allow any FDI (e.g., Mexico, Saudi Arabia) in developing their petroleum resources.

Second, petroleum is one of the largest industries for cross-border investment. Notwithstanding past nationalizations, multinationals account for much of the investment in the industry. This is partially a result of geology – petroleum reserves are scattered across the globe, much of them in nations lacking well-developed legal and security systems as well as a weak private sector.

Third, many countries are dependent on petroleum for a substantial part of their economies, exports, and fiscal revenues. Given the high economic stakes, government intervention in the industry is widespread, and hence so is the opportunity for wrestling over rents with MNEs.[1] Moreover, the high economic stakes and weak property rights give to rent seeking by private groups through bribery or armed conflict. According to the World Bank (Bannon and Collier 2003), natural resource abundance exacerbates the risk of violent conflict.

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[1] This interaction takes many forms far less dramatic than expropriation. For example, Jones (1984) and Makhija (1993) examine government intervention in the Venezuelan petroleum industry in the period prior to nationalization.

Civil conflict has exacerbated political risk in oil countries such as Angola, Chad, Indonesia, and Nigeria.

Fourth, a resurgence of "resource nationalism" has accompanied the dramatic rise in prices of natural resources, especially petroleum, in the 21st century. Resource nationalism has raised the profile of political risk in many oil countries, as well as researchers' interest in understanding the phenomenon. After a long period with little nationalization worldwide, governments have unilaterally changed petroleum contract terms, royalty rates, or taxes *ex post* in Algeria, Bolivia, Chad, Ecuador, Russia, the United Kingdom, and Venezuela. Proposals for such polices have been made by government officials in many oil-producing countries, including Canada and the United States ("windfall profits tax").

In addition to environmental factors that make the petroleum industry a fruitful place to examine political risk, researchers benefit from data availability in several ways. Quantitative data have become more important to political-risk research as scholarship has moved from more subjective and descriptive measures to statistical analysis (see e.g., Click 2005).

The sheer size of the industry (petroleum is the largest single item by value in international trade, using 3-digit SITC codes) has generated intense scrutiny, and extensive data collection. In addition to data collected by government agencies, numerous consulting firms and trade publications collect data on various aspects of the industry.[2]

Moreover, a liquid market for trade in assets allows researchers to examine directly the influence of political risk. Empirical research is facilitated by asset homogeneity – unlike manufacturing, where value cannot easily be compared across plants, petroleum assets – oil and

[2]Data used in this paper come from two such firms, John S. Herold (JSH), and Energy Security Analysis Inc. (ESAI), and one such publication, *Petroleum Intelligence Weekly*. All are long-established and well-regarded in the industry.

gas reserves in the ground – produce similar products everywhere. Further, such asset heterogeneity as exists can be largely controlled for through the use of proxies for production cost.

Finally, the very fact that asset location decisions are exogenous (determined through geology, not managerial decisionmaking) serves both to eliminate self-selection/simultaneity bias in empirical analysis in general, and to allow examination of a much wider set of nations than is ordinarily possible in studies of international investment. Our data include host countries that ordinarily would be problematic for examining such investment, including sub-Saharan countries such as Angola and Sudan, Middle Eastern countries such as Syria and Yemen, and Asian counties such as Myanmar and Papua New Guinea, in addition to a geographically and industrially diverse group of countries more commonly included in studies of FDI.

III. Petroleum Asset Markets

The assets traded are oil and gas in the ground, known as reserves. The exact size of reserves is unobservable by market participants; instead a probabilistic definition is employed. Oil and gas assets are typically characterized as proved (1P) or proved + probable (2P). *Proved reserves* refers to the quantity of oil and gas in the ground that are extractable economically with 90 percent probability at current prices and costs. *Probable reserves* are similarly defined, but with 50 percent probability. Reserves are the capital base of the firm, and serve as collateral for loans, so considerable care is taken in estimating their size, typically by independent consulting firms specializing in reserve audits, which are based on engineering, petroleum geology, and experience. Reserves are sufficiently important to firm value that announcements of reserve resents typically are associated with abnormal stock returns.

Reserves are traded in three primary ways. Mergers entail purchase of a target firm, including its assets and liabilities. Acquisitions are like mergers, but entail purchase of only a fraction of the target firm's equity. Asset sales refer to specific geological assets, and entail no claim on the seller's equity. All three ways are included in the database, but asset sales predominate. Such sales are typically smaller in size and value than mergers and acquisitions, although there are exceptions. For example, two of the largest transactions in 2006 were Norsk Hydro's sale of its oil and gas operations to Statoil for about $29 billion, and Gazprom's purchase of a 50 percent share of the Sakhalin II consortium from Royal Dutch Shell, Mitsui, and Mitsubishi for about $7.5 billion.[3]

How much is oil and gas in the ground (reserves) worth? Does political risk influence these values? If so, how much of a discount should be applied with increasing political risk? We take up these questions in this paper, using transaction data on petroleum reserves. The statistical analysis below can be foreshadowed by a simple graph of the value of petroleum reserves against expected future petroleum prices.

Figure 1 shows that a linear relationship between the log of asset value and the log of expected petroleum price is likely to fit well, but that there is a great deal of dispersion in reserve values. How much of the reserve discount (or premium) is due to political risk? Figure 1 suggests this visually by highlighting the three non-North American countries with the most deals – Indonesia, Russia, and the United Kingdom. The first two of these tend to score low on political-risk indexes (scaled 0-100, where 100 means no political risk). A substantial political-

[3] Values are converted from local currency to US$ using FX rates on the day of the announcement. The former deal's reserves are primarily in Norway, the latter's in the Russian Far East. See the discussion of the two deals in Timmons (2006) and Crooks and Ostrovsky (2006) respectively.

risk discount can be inferred from the graph, relative to both deals in general, and the UK in particular.

With one exception,[4] researchers have examined the reserves market only in a limited context of testing the Hotelling (1931) theory of resource prices, which predicts that the net price (price of the resource once extracted less extraction cost) of a natural resource in the ground will rise over time at the interest rate as the resource is depleted. Adelman, De Silva and Koehn (1991), Thompson (2001), and Adelman and Watkins (2005) use reserve data from US oil and gas asset transactions to test the Hotelling theory.[5]

III. Theory and Hypotheses

The value of a petroleum reserve is given by:

$$(1)\ V_R = R(P^E - C^E)$$

where V_R refers to reserve value, R is the size of the reserve, and P^E and C^E are expected petroleum prices and costs over the life of the reserve respectively. In practice, costs are taken as proportional to prices, both because the main component of costs is output taxes, and because production costs tend to rise with prices.[6] Dividing equation (1) by R and rewriting in logarithmic form yields the equation we estimate:

[4] Ghicas and Pastena (1989) examined cashflows associated with reserves reported in firms' 10-K filings as predictors of values in 44 US petroleum mergers.
[5] Adelman and Watkins (1995) tested the theory using a sample of 34 Canadian reserve transactions. These articles find that the data are not consistent with the predictions of the Hotelling theory.
[6] Adelman and Watkins (2005) note that cost data are unavailable, and assume cost is 35 percent of price.

$$(2)\ \log[V_R / R] = \alpha \log P^E + \beta(politicalrisk) + \sum \gamma_i \cos tproxy + \sum \delta_i controls_i + \mu + \varepsilon$$

We follow the literature using accounting data to value petroleum companies in using the value of reserves in the ground on a per-barrel basis V_R/R as the dependent variable; which should help reduce heteroscedasticity problems associated with orders-of-magnitude variation in reserve sizes.[7] We model V_R/R as dependent on the expected petroleum price P^E, political risk, proxies for extraction cost, and other control variables.

The value of petroleum in the ground should depend on its market price once extracted. Proxies for this price should reflect expectations of future spot prices prevailing at the time of the transaction. Expectations are unobservable; instead we use the futures strips for crude oil and natural gas to measure expected petroleum prices.[8] In order to proxy for price expectations, crude-oil and natural-gas futures prices must be unbiased predictors of future spot prices. Chinn et al (2005) found unbiasedness for one-year contract maturities, but longer maturities have not been tested.

The reserve value V_R is calculated by the U.S. firm John S Herold Incorporated (JSH) by subtracting from the reported total market value of the transaction V, the value of non-reserve assets included in the deal. Such assets typically include undeveloped acreage, processing plants, etc., which JSH subtracts based on book values or market values, according to asset type and data availability. Merger transactions typically also include cash, debt and other liabilities, etc. On average, the value of non-reserve assets is modest, roughly 10 percent of transaction

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[7] A small literature (e.g., Miller and Upton 1985, Magliolo 1986, Harris and Ohlson 1987, Thompson 2001) focuses on book-value and market-value information in US petroleum exploration & production firms' 10-K filings, rather than market transactions.

value. However, because V_R is imputed based on accounting data, we also run our regressions using the market figure, total transaction value per unit of reserves V/R, as a dependent variable.

The value of a petroleum reserve depends on the nature of the reserve and the cost of extraction. We control for factors affecting value by including a dummy variable for heavy oil (which fetches less in world markets), and the gas (vs. oil) percentage of the reserve.[9] We control for extraction-cost differences through use of dummy variables for the technology employed to recover and process the petroleum to get it to market. Our dummy variables include onshore conventional (the omitted dummy); offshore deep water; offshore shallow water; LNG (liquefied natural gas); coalbed methane; other unconventional gas; synthetic crude oil from tarsands; frontier and enhanced recovery production; diversified; and royalty interest.

All of these technologies but the last two are costlier than conventional petroleum extraction, and should decrease the value of the reserve. Diversified refers to packages of reserves with diverse characteristics; its effect on reserve value is unclear. Royalty interest is an entitlement to petroleum from the reserve without paying extraction cost, and should increase the reserve value.[10]

Our final control variable is the source of the transaction information; despite the fact that reserves are typically assessed by outside consultants, buyers may be systematically more

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[8] We calculate the strips as averages of futures prices for the nearest 36 months ahead for crude oil and natural gas traded on the New York Mercantile Exchange. For each reserve transaction, a weighted strip price was constructed, with the weights being the percent oil and percent gas in the reserve.

[9] R includes both crude oil and natural gas, which are often found together in petroleum reserves, and is measured in barrels of oil equivalent (boe). We follow the literature in aggregating oil and gas on a thermal-equivalent basis: $R = R_O + R_G/6$, where R_O and R_G are oil and gas reserves, measured in barrels (bbl) and thousand cubic feet (mcf) respectively. The energy in 1 bbl of oil and 6 mcf of gas are equal on average, although figures vary some across reserves. As pointed out by Adelman (2005), however, the ratio of the market values of oil and gas need not be equal to their thermal ratios. We account for this by including, *percent gas* = $R_G/6R$ in our control variables.

optimistic in interpreting reserve data and advice than sellers, and report larger reserves. If this is the case, then both V_R/R and V/R will be systematically lower for buyer-reported than seller-reported transactions.

IV. Data

Reserve deals are typically announced by transactors, and reported in the trade and business press. Transaction data are compiled by consulting firms, investment banks, and the trade press. The transaction data we use are collected and maintained by JSH; a subset (those of at least $50 million) is published each year in *Petroleum Intelligence Weekly*, a leading trade publication. There are many smaller deals, which we obtained from JSH.[11]

Our sample covers the period 2000 through 2006Q3, for which JSH reported 1793 reserve deals of at least $10 million, of which 1056 were for at least $50 million, 741 were for at least $100 million, and 123 for at least $1000 million. For each deal, we obtained the announcement date, transaction value, reserve value, reserve size, location, technology/cost proxies (such as whether the reserves were offshore; see discussion above). Also obtained were the reserve oil vs. gas percentages,[12] as well as whether the deal was reported by the buyer or seller.

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[10] Royalty interests belong to the owner of the subsurface rights, typically the owner of the land underneath which the reserve lies, but can be sold to third parties. Non-royalty interests are referred to as "working interests."

[11] We are indebted to JSH for access to their transactions database.

[12] Reserve sizes are aggregated on an energy-equivalent basis, referred to as barrel of oil equivalent (boe). One barrel of oil contains the energy of 6 thousand cubic feet of natural gas (mcf). Because oil and gas values differ on a per boe basis, the oil/gas composition serves as a control.

Our sample includes 1657 of the 1793 $10 million+ deals; excluded are deals that did not close (typically offers that were refused by sellers),[13] equity purchases through stock markets, and volumetric production payments, a means of renting reserves for a limited time.

We matched the JSH data with two other types of potentially-important determinants of reserve value prevailing on the deal's announcement date – expected future petroleum prices and measures of political risk. We constructed two proxies for price expectations – the futures strip prices for oil and gas traded on the New York Mercantile Exchange (NYMEX) described above, and the price of the BP Royalty Trust, a security traded on the New York Stock Exchange (ticker: BPT) since 1989. These time series are plotted in Figure 2 along with the spot price of oil. BPT is an unmanaged royalty trust, whose value depends primarily on future oil prices over the life of BP's Prudhoe Bay field, the largest in the USA.[14] Expectations of future oil prices determine the value of BPT, and hence can be imputed from BPT market prices (Verleger 1994). For our sample period, however, BPT moved closely with the strip prices, as seen in Figure 2; we report empirical results using only the latter in this paper although results using BPT are available from the authors upon request.

Our measures of political risk are the International Country Risk Guide (ICRG) rating of political risk and the *Institutional Investor* rating of country creditworthiness. Both ratings are on a 100-point scale in which high numbers signify low risk. ICRG distributes (through the PRS Group) a rating of country risk and three sub-ratings -- for political, financial, and economic risk – on a monthly basis. We focus on the political risk rating as the subject of interest. This rating

[13] The JSH database includes deals under $10 million, but JSH does not include them in its reports on transaction activity. Smaller deals tend to be less well documented, and we do not include them in our analysis below.

[14] We are grateful to Energy Security Analysis Inc. (ESAI) for providing strip data. BPT data are from DataStream.

is composed of 12 weighted variables covering both political and social attributes, including: government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religion in politics, law and order, ethnic tensions, democratic accountability, and bureaucracy quality.[15] The *Institutional Investor* rating is based on a semiannual survey of up to 100 bankers from around the world who are asked to rate country creditworthiness. The responses are weighted according to the exposure of the bank and the sophistication of the bank's analytical model to form the *Institutional Investor* credit rating published in the March and September issues of the magazine. We match the ICRG and *Institutional Investor* rating to each of the oil reserve transactions based on the rating in effect on the announcement date.

V. Results

The main results from estimating equation (2) are contained in Table 1. The dependent variable is either the (log of) the reserve value in the transaction per boe or the (log of) the total value of the transaction per boe. Regressions (1) and (2) utilize the ICRG political risk rating and regressions (3) and (4) utilize the *Institutional Investor* country rating. Results from using the total value of the transaction per boe are quite similar to the results from using the reserve value, suggesting that we do not need to worry about the distinction between a pure market number and the more meaningful one after an accounting-based adjustment. We therefore focus most of our attention on regressions (1) and (3).

Regressions (1)-(4) have adjusted R^2 values of about 0.50, suggesting that the equations explain about 50% of the variation in the dependent variables. This is fairly high, and suggests

[15] For more information, see www.prsgroup.com.

that careful examination of the results is warranted, although we are clearly not able to fully explain value in terms of these few determinants.

In all four regressions, the coefficient on the percentage of gas in the transaction is small but statistically significantly positive. In an all-gas transaction, value per boe is approximately 0.3% to 0.4% higher than an otherwise similar all-oil transaction. We retain this variable for its statistical significance, although its economic significance is clearly minimal.

Dummy variables pertaining to the type of oil reserve, if not conventional, are utilized to distinguish differences in extraction costs. The coefficients on these ten dummy variables are presented at the bottom of the table. Not all coefficients are statistically significant, although the variables are kept so that a complete set of dummy variables remains intact. Notable coefficients are on coalbed methane, heavy oil, LNG, synthetic crude, all of which are costlier to produce than conventional oil reserves and thus depress the value per boe. Pure royalty interest, which is not associated with costs of extraction at all, raise the value per boe in the range of \$0.33 to \$0.45.

Other coefficients in Table 1 have the expected signs and are typically logical values. The elasticity of the value with respect to the price of oil/gas is statistically significantly positive, and above unity. In regression (1), a 1% increase in the per-barrel price of oil increases the value of reserves by 1.24%, suggesting that the revenues from extraction increase more than costs. Similar coefficients are found in the other regressions, although coefficients in regressions (3) and (4) are somewhat lower. The coefficient on the dummy for information being reported by the buyer is statistically significantly negative, and ranges from -0.107 to -0.146. The interpretation of this is that information coming from the buyer is associated with about a 10-

15% lower value of the asset, as if the buyer received a "good deal" and thus has an incentive to release information.

The coefficients on the political risk ratings are positive and statistically significant. In regressions (1) and (2), the coefficient of 0.029 indicates that a 1-point increase in the ICRG political risk rating is associated with a 2.9% rise in value per boe. A downgrade of 35 points will thus wipe out the entire value of the oil and gas, which is somewhat incredible. The variable empirically ranges from about 45 to 91, for a range of 46 points, suggesting that greater losses are possible. In regressions (3) and (4), the coefficient of 0.014 indicates that a 1-point increase in the *Institutional Investor* country risk rating is associated with a 1.4% rise in value per boe. Thus, a downgrade of 71 points will wipe out the entire value of the oil and gas. However, the variable empirically ranges from about 11 to 93, for a range of 82 points, or slightly less than double the range of the ICRG index. It is thus not too surprising that the coefficient on the *Institutional Investor* rating is smaller than (and roughly half the size of) the coefficient on the ICRG rating.

The coefficients on the political risk and country risk ratings can be used to estimate the discount on oil and gas reserves associated with the riskiness of the country in which the reserves are located. For example, we can consider what the reserves in risky countries would be worth if they were located in the United States. Table 2 presents the results.

In the ICRG index, the U.S. has a weighted-average rating of 83 (where the weights are the number of transactions occurring within a time period as a proportion of all transactions for the country). Although we use the U.S. as the benchmark, several countries actually have higher ratings, making them safer countries. These include Canada, the U.K., Norway, Australia, Netherlands, Denmark, Ireland, and New Zealand. Denmark and New Zealand have the highest weighted-average rating, at 91. Other countries can be considered based on their distance from the U.S. rating of 83. The average rating for Russia, for example, is 63. We may naturally ask what the discount on Russian oil and gas is, based on the gap of (83-63=) 20 points. The discount for Russian assets is thus (20)(.029) = 58%. This means that reserves in Russia trade at a 58% discount compared to what they would fetch if they were in the United States.

In the *Institutional Investor* index, the U.S. has a weighted-average rating of 93. A few countries have this rating as well (the U.K., the Netherlands, and France), but no countries have a higher rating. The average rating for Russia is 42, for a gap of (93-42=) 51 points. The discount for Russian assets is thus (52)(.014) = 74%. This means that reserves in Russia trade at a 74% discount compared to what they would fetch if they were in the United States.

The discounts on oil and gas assets in other countries are presented in Table 2. On the whole, the numbers are very large, indicating that the level of political and country risk is an important determinant of value. The magnitudes suggest that the topic warrants further investigation.

Table 3 presents results from an alternative specification of the model in which there is an interaction between the price of oil and the risk rating. This specification considers the hypothesis that the discount for political/country risk is partially a function of the price of oil. We formulate the interaction as [100 – Rating][log (Strip Price)]. If political risk is higher [lower] when the price of oil is high, the interaction term will have a negative [positive] coefficient. The results in Table 3 convincingly support the intuition that the discount for political risk is higher when the price of oil is high.

Regressions (5) and (6) in Table 3 use the ICRG index of political risk. The mean of the log of the strip price is 3.48 (or $32.46 per barrel) and the mean of the ICRG index is approximately 83 (which is the average for the U.S. alone also). At these means, and using the coefficients in regression (5), the elasticity of reserve value with respect to oil price is [1.907-0.039*(100-83) =] 1.244 and a one-point increase in the ICRG index raises the reserve value by [-0.101+0.039*3.48 =] 0.035 or 3.5%. These are actually somewhat higher than the values of 1.241 and 0.029 reported in regression (1).

The fluctuations around these means reveal interesting results for riskier countries. For example, in Russia, a country with an ICRG rating of 63, the elasticity of reserve value with respect to oil price is very low, at [1.907-0.039*(100-63) =] 0.464. This clearly suggests that a 1% increase in the per-barrel price of oil increases the value of reserves by just about one-half percent. If the costs of extraction at a higher price are not different from the costs of extraction at the lower price, the benefits of the price increase clearly do not accrue to the owner of the reserve. This would be consistent with a story in which the government intervenes in the oil industry more when the price of oil is high. At the average price of oil, the discount on reserves in Russia compared to the U.S. is thus (20)(.0347) = 0.694 or 69%. However, if the price of oil is $25 per barrel, the discount on reserves in Russia is just [20][-0.101+0.039*ln(25) =] 0.490 or 49%. If the price of oil is $40 per barrel, the discount on reserves in Russia is an astonishing [20][-0.101+0.039*ln(40) =] 0.857 or 86%. Table 4 presents the illustration of the discount for all countries under the scenarios of $25 per barrel and $40 per barrel.

Regressions (7) and (8) in Table 3 use the *Institutional Investor* index of country risk, which has a mean of 86. Noting that the coefficients on the index are statistically insignificant, we focus attention on the interaction term. Using the coefficients in equation (7), the elasticity of reserve value with respect to oil price is [1.233-0.010*(100-86) =] 1.093 and a one-point increase in the *Institutional Investor* index raises the reserve value by [0.010*3.48 =] 0.0348 or 3.5%. An examination of fluctuations around these means provides results similar to those found above. In the *Institutional Investor* index, Russia has a rating of 42, so the elasticity of reserve value with respect to oil price is [1.233-.010*(100-42)=] 0.653. At the average price of oil, the discount on reserves in Russia compared to the U.S. is thus (93-42)(0.0348)=177%. However, if the price of oil is $25 per barrel, the discount on reserves in Russia is [51][0.010*ln(25) =] 1.642 or 164%. If the price of oil is $40 per barrel, the discount on reserves in Russia is [51][0.010*ln(40) =] 1.881 or 188%.

VI. Concluding Observations

This paper has shown that political risk destroys asset value, and that the extent of such value destruction is substantial. In doing so, we have made two advances of potential interest to researchers. First, we demonstrate how to utilize data from transactions in real assets (here petroleum reserves) to measure the cost of political risk. Second, we introduce the hypothesis that political risk and market risk cannot be assessed separately, as assumed in the literature, and demonstrate how to account for their interactions. Our findings confirm the view that political risk depends on market conditions – as assets become more valuable due to market conditions, a greater fraction of their value is destroyed by political risk.

REFERENCES

Adelman, M.A, H. De Silva and M.F. Koehn, "User Cost in Oil Production," *Resources and Energy* 13(3): 217-240.

Adelman, M.A. and G.C. Watkins (1995) "Reserve Asset Values and the Hotelling Valuation Principle: Further Evidence," *Southern Economic Journal* 61 (3): 664-673.

Adelman, M.A. and G.C. Watkins (2005) **"**U.S. oil and natural gas reserve prices, 1982-2003**,"** *Energy Economics* 27 (4): 553-571.

Bannon, I., and P. Collier (2003), *Natural Resources and Violent Conflict: Options and Actions*, Washington DC: World Bank.

Bilson, C.M., T.J. Brailsford, and V.C. Hooper (2002), "The explanatory power of political risk in emerging markets," *International Review of Financial Analysis* 11(1), 1-27.

Campos, N.F., and J.B. Nugent (2002), "Who is afraid of political instability?" *Journal of Development Economics* 67(1), 157-172.

Cosset, J.C. and J. Roy (1991), "The determinants of country risk ratings," *Journal of International Business Studies* 22(1), 135-142.

Crooks, E., and A. Ostrovsky (2006), "Shell learns cold reality of Sakhalin deals," *Financial Times*, 21 December.

Chinn, M.D., M. LeBlanc, and O. Coibion (2005) **"**The Predictive Content of Energy Futures: An Update on Petroleum, Natural Gas, Heating Oil and Gasoline," NBER Working Paper 11033.

Click, R. W. (2005) **"**Financial and political risks in US direct foreign investment," *Journal of International Business Studies* 36 (5): 559-575.

Diamonte, R.L., J.M. Liew, and R.L. Stevens (1996), "Political risk in emerging and developed markets," *Financial Analysts Journal* 52(3), 71-76.

Erb, C.B., C.R. Harvey, and T.E. Viskanta (1996), "Political risk, economic risk, and financial risk," *Financial Analysts Journal* 52(6), 29-46.

Ghicas, D., and V. Pastena (1989), "The acquisition value of oil and gas firms: The role of historical costs, reserve recognition accounting, and analysts' appraisals,". *Contemporary Accounting Research* 6(1): 125-142

Harris, T.S., and J.A. Ohlson (1987), "Accounting Disclosures and the Market's Valuation of Oil and Gas Properties," *Accounting Review* 62(4): 651-670.

Hotelling, H. (1931) "The Economics of Exhaustible Resources", *Journal of Political Economy* 39 (2): 137-175.

Howell, L.D. (2006), *The Handbook of Country and Political Risk Analysis* (3rd edition), The PRS Group, East Syracuse, NY.

Jones, R. J. (1984) "Empirical Models of Political Risks in U.S. Oil Production Operations in Venezuela," *Journal of International Business Studies* 15(1): 81-95.

Kobrin, S.J. **(**1980) Foreign enterprise and forced divestment in the LDCs," *International Organization* 34 (1): 65-88.

Kobrin, S.J. **(**1984) "Expropriation as an attempt to control foreign firms in LDCs: Trends from 1960-1979," *International Studies Quarterly* 28(3): 329-48.

Kobrin, S.J. **(**1985) "Diffusion as an explanation of oil nationalization," *Journal of Conflict* Resolution 29 (1): 3-32

Makhija, M. (1993) "Government Intervention in the Venezuelan Petroleum Industry: An Empirical Investigation of Political Risk," *Journal of International Business Studies* 24(3): 531-555.

Magliolo, J. (1986) "Capital Market Analysis of Reserve Recognition Accounting." *Journal of Accounting Research* 24(3): 69-108

Miller, M., and C. Upton. "A Test of the Hotelling Valuation Principle." *Journal of Political Economy* 93(1): 1-25.

Osborn, A., and M. Harrison (2006) "Russian bear ready to maul Western oil majors," *The Independent*, 20 September.

PIW (2007a) "Resource Nationalism: Then and Now," *Petroleum Intelligence Weekly*, 8 Jan..

PIW (2007b) "Sparks Fly Over Soaring Project Costs," *Petroleum Intelligence Weekly*, 1 Jan..

Thompson, A. (2001) "The Hotelling Principle: Backwardation of Futures Prices and the Values of Developed Petroleum Reserves – The Production Constraint Hypothesis," *Resource and Energy Economics* 23(2): 133-156.

Timmons, H. (2006) "Statoil Will Buy Rival's Energy Units to Create World's Largest Offshore Operator," *New York Times*, 18 December.

Verleger, P.K. (1994) Adjusting to Volatile Energy Prices, Washington DC: Institute for international Economics.

Table 1
Determinants of Value of Petroleum in the Ground
(Heteroscedasticity-consistent standard errors in parentheses)

	(1) Reserve Value	(2) Total Value	(3) Reserve Value	(4) Total Value
Constant	-4.750*** (0.322)	-4.726*** (0.319)	-3.104*** (0.199)	-3.029*** (0.200)
Gas Percent	0.003*** (0.001)	0.004*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
Strip Price (log value)	1.241*** (0.048)	1.248*** (0.048)	1.108*** (0.048)	1.118*** (0.049)
ICRG Rating	0.029*** (0.003)	0.029*** (0.003)		
Institutional Investor Rating			0.014*** (0.002)	0.014*** (0.002)
Buyer Report	-0.107*** (0.035)	-0.129*** (0.036)	-0.126*** (0.036)	-0.146*** (0.037)
Coalbed Methane	-0.276*** (.105)	-0.257** (.103)	-0.332*** (.099)	-0.312*** (.097)
Heavy Oil	-0.364*** (0.121)	-0.386*** (0.125)	-0.366*** (0.132)	-0.384*** (0.136)
LNG	-0.845** (0.330)	-0.865*** (0.323)	-0.900*** (0.317)	-0.944*** (0.307)
Other Unconventional	-0.114 (0.083)	-0.035 (0.102)	-0.216** (0.090)	-0.136 (0.109)
Synthetic Crude	-1.009*** (0.191)	-0.746*** (0.218)	-0.973*** (0.199)	-0.704*** (0.224)
Shallow Water	-0.150 (0.138)	-0.178 (0.143)	-0.170 (0.130)	-0.199 (0.135)
Deepwater	0.124 (0.131)	0.207 (0.171)	0.045 (0.115)	0.129 (0.159)
Frontier	-0.432 (.384)	-0.465 (.392)	-0.385 (.379)	-0.435 (.387)
Diversified	0.104 (0.079)	0.137 (0.085)	0.097 (0.086)	0.131 (0.093)
Royalty Interest	0.450** (0.215)	0.384* (0.214)	0.395** (0.188)	0.326* (0.192)
Adjusted R^2	0.51	0.51	0.50	0.48
Observations	1007	1007	1004	1004

Table 2
Estimates of the Asset Discount by Country, relative to the United States
(negative numbers indicate premia)

COUNTRY	Number of Transactions	ICRG Average	ICRG Discount	Institutional Investor Average	Institutional Investor Discount
United States*	460	83	0%	93	0%
Canada*	356	87	-12%	90	4%
United Kingdom*	27	88	-14%	93	0%
Indonesia*	17	48	101%	26	97%
Russia*	17	63	58%	42	74%
Argentina*	10	71	35%	37	81%
Norway	8	89	-17%	92	1%
Australia*	7	88	-14%	86	10%
Kazakhstan*	7	72	32%	44	71%
China*	6	66	49%	60	48%
Algeria	5	48	101%	32	88%
Netherlands*	4	90	-20%	93	0%
Thailand	4	69	40%	61	46%
Trinidad & Tobago*	4	71	35%	54	56%
Brazil	3	66	49%	44	71%
Colombia*	3	51	92%	42	74%
Denmark	3	91	-23%	89	6%
Egypt	3	65	52%	49	64%
Azerbaijan	2	58	72%	---	---
Tunisia	2	74	26%	55	55%
Croatia	1	73	29%	47	67%
Ecuador*	1	56	78%	23	101%
France	1	79	12%	93	0%
Guatemala*	1	64	55%	33	87%
India*	1	56	78%	47	67%
Ireland	1	90	-20%	91	3%
Israel	1	62	61%	64	42%
Japan	1	83	0%	85	12%
Malaysia*	1	66	49%	31	90%
Namibia	1	77	17%	39	78%
New Zealand*	1	91	-23%	76	25%
Oman*	1	78	14%	55	55%
Papua New Guinea*	1	57	75%	29	93%
Philippines	1	70	38%	46	68%
Romania	1	72	32%	43	72%
Sudan	1	45	110%	11	119%
Syria	1	59	69%	31	90%
Venezuela*	1	49	98%	31	90%
Diversified	40	76	20%	68	36%

* Denotes a country also included in at least one country-diversified transaction.

Table 3
Determinants of Value of Petroleum in the Ground
(Heteroscedasticity-consistent standard errors in parentheses)

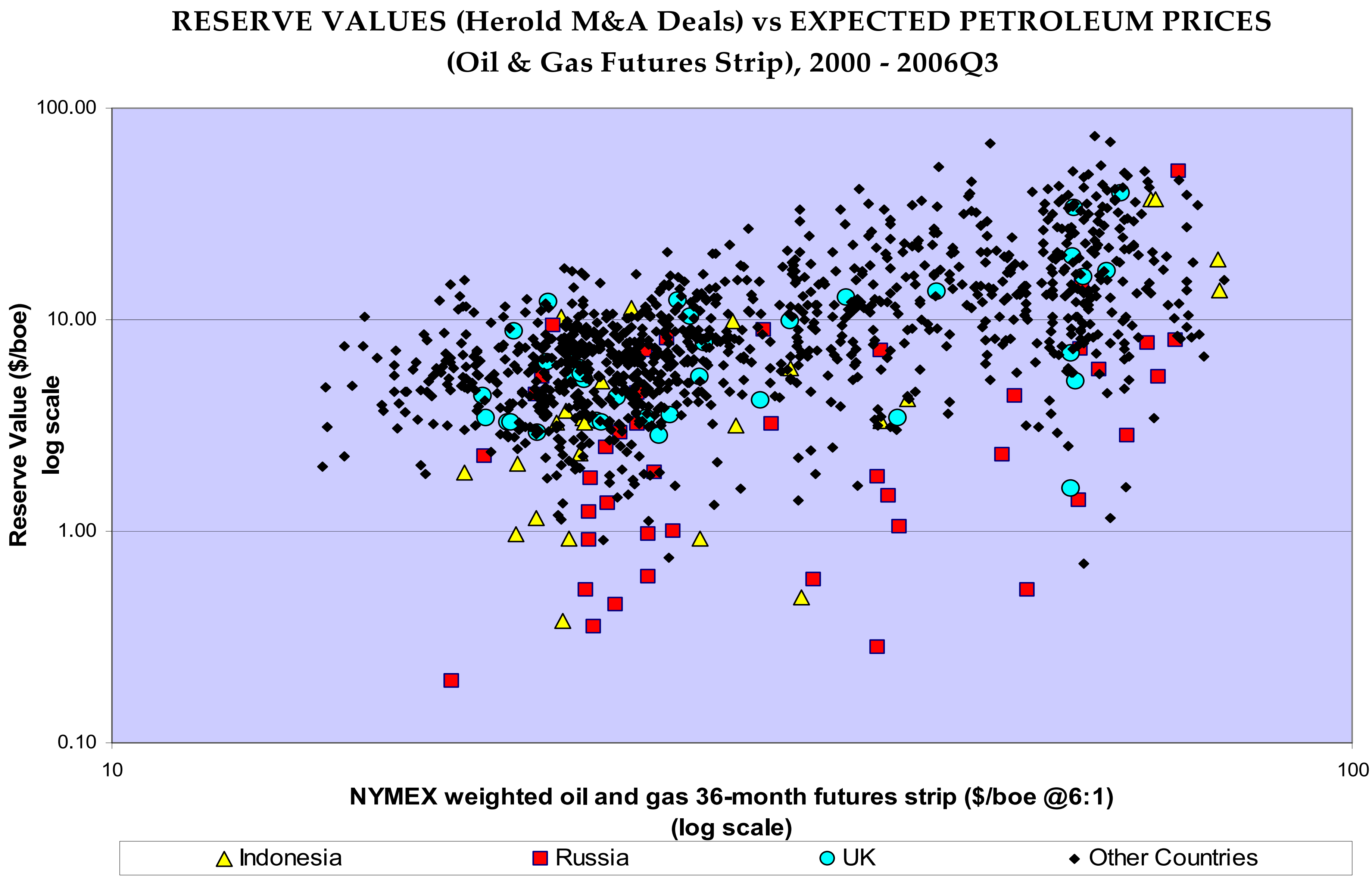
	(5) Reserve Value	(6) Total Value	(7) Reserve Value	(8) Total Value
Constant	6.0126** (2.713)	4.877* (2.686)	-0.177 (1.282)	-0.634 (1.272)
Gas Percent	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
Strip Price (log value)	1.907*** (0.171)	1.843*** (0.169)	1.233*** (0.168)	1.221*** (0.069)
ICRG Rating	-0.101*** (0.003)	-0.086*** (0.032)		
Interaction	-0.039*** (0.010)	-0.035*** (0.010)		
Institutional Investor Rating			-0.019 (0.014)	-0.013 (0.014)
Interaction			-0.010** (0.004)	-0.008* (0.004)
Buyer Report	-0.101*** (0.034)	-0.125*** (0.035)	-0.136*** (0.036)	-0.154*** (0.037)
Coalbed Methane	-0.286*** (.109)	-0.267** (.106)	-0.331*** (.098)	-0.312*** (.096)
Heavy Oil	-0.385*** (0.120)	-0.405*** (0.122)	-0.373*** (0.132)	-0.390*** (0.135)
LNG	-0.959*** (0.311)	-0.967*** (0.304)	-0.959*** (0.310)	-0.990*** (0.301)
Other Unconventional	-0.090 (0.081)	-0.013 (0.104)	-0.222** (0.089)	-0.141 (0.108)
Synthetic Crude	-1.037*** (0.164)	-0.771*** (0.193)	-0.986*** (0.185)	-0.715*** (0.213)
Shallow Water	-0.106 (0.152)	-0.139 (0.156)	-0.171 (0.131)	-0.199 (0.136)
Deepwater	0.129 (0.145)	0.212 (0.181)	0.015 (0.116)	0.104 (0.160)
Frontier	-0.441 (.355)	-0.473 (.365)	-0.405 (.365)	-0.452 (.376)
Diversified	0.113 (0.073)	0.144* (0.080)	0.096 (0.084)	0.130 (0.092)
Royalty Interest	0.496*** (0.166)	0.424** (0.170)	0.425*** (0.164)	0.351*** (0.172)
Adjusted R^2	0.53	0.52	0.50	0.49
Observations	1007	1007	1004	1004

Table 4
Estimates of the Asset Discount by Country, relative to the United States, for oil at
(negative numbers indicate premia)

	ICRG Discount	
COUNTRY	Oil at $25/barrel	Oil at $40/barrel
United States*	0%	0%
Canada*	-10%	-18%
United Kingdom*	-13%	-22%
Indonesia*	90%	155%
Russia*	52%	88%
Argentina*	31%	53%
Norway	-15%	-27%
Australia*	-13%	-22%
Kazakhstan*	28%	49%
China*	44%	75%
Algeria	90%	155%
Netherlands*	-18%	-31%
Thailand	36%	62%
Trinidad & Tobago*	31%	53%
Brazil	44%	75%
Colombia*	82%	142%
Denmark	-21%	-35%
Egypt	46%	80%
Azerbaijan	64%	111%
Tunisia	23%	40%
Croatia	26%	44%
Ecuador*	70%	119%
France	10%	18%
Guatemala*	49%	84%
India*	70%	119%
Ireland	-18%	-31%
Israel	54%	93%
Japan	0%	0%
Malaysia*	44%	75%
Namibia	15%	27%
New Zealand*	-21%	-35%
Oman*	13%	22%
Papua New Guinea*	67%	115%
Philippines	33%	57%
Romania	28%	49%
Sudan	98%	168%
Syria	62%	106%
Venezuela*	88%	150%
Diversified	18%	31%

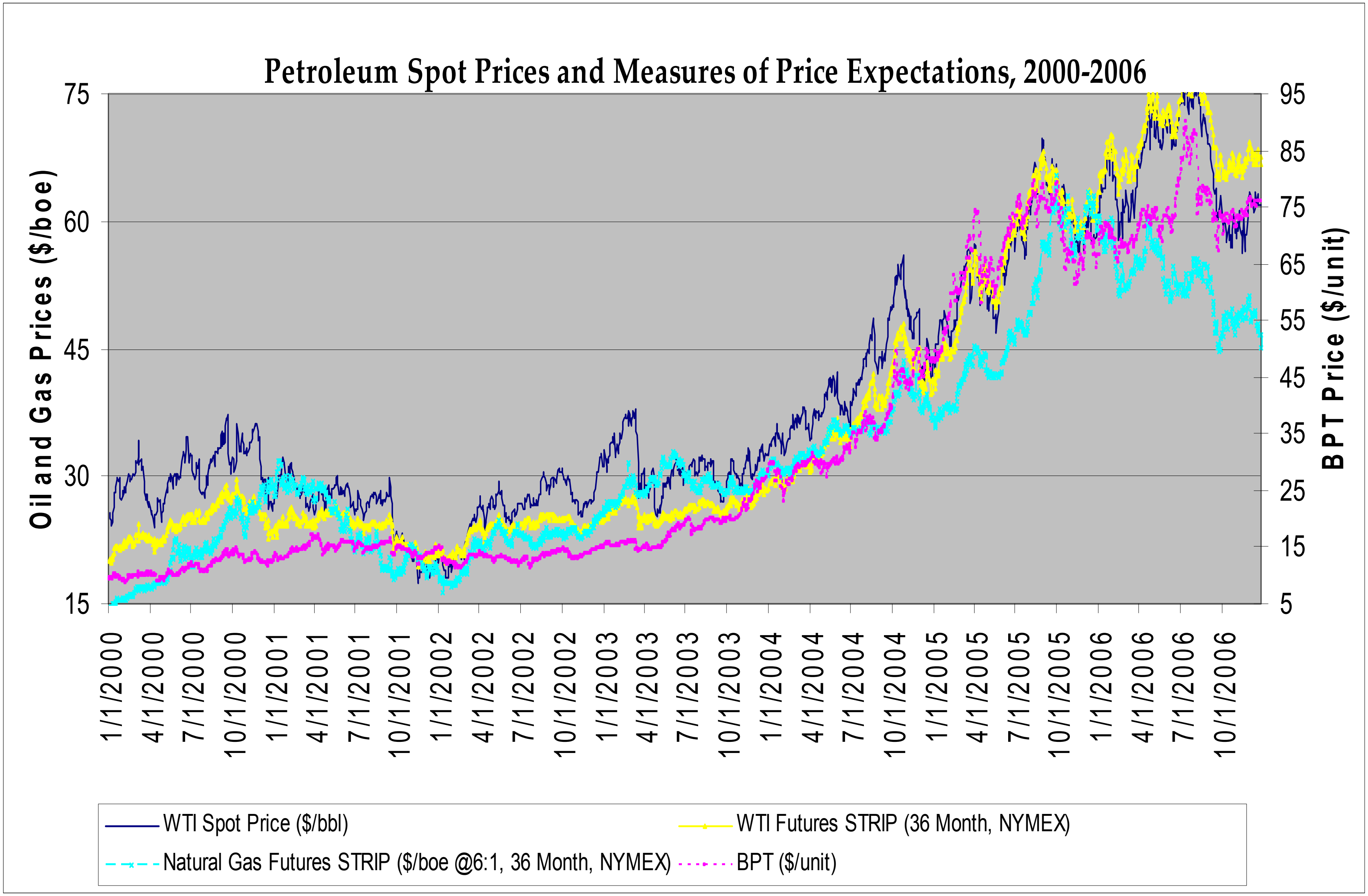
* Denotes a country also included in at least one country-diversified transaction.

FIGURE 1



RESERVE VALUES (Herold M&A Deals) vs EXPECTED PETROLEUM PRICES
(Oil & Gas Futures Strip), 2000 - 2006Q3
100.00
10.00
1.00
0.10
Reserve Value ($/boe)
log scale
10
100
NYMEX weighted oil and gas 36-month futures strip ($/boe @6:1)
(log scale)
Indonesia
Russia
UK
Other Countries

FIGURE 2



Petroleum Spot Prices and Measures of Price Expectations, 2000-2006
Oil and Gas Prices ($/boe)
BPT Price ($/unit)
75
60
45
30
15
95
85
75
65
55
45
35
25
15
5
1/1/2000
4/1/2000
7/1/2000
10/1/2000
1/1/2001
4/1/2001
7/1/2001
10/1/2001
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1/1/2005
4/1/2005
7/1/2005
10/1/2005
1/1/2006
4/1/2006
7/1/2006
10/1/2006
WTI Spot Price ($/bbl)
WTI Futures STRIP (36 Month, NYMEX)
Natural Gas Futures STRIP ($/boe @6:1, 36 Month, NYMEX)
BPT ($/unit)