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**The Impact of Climate Change Policy on the Australian Oil and Gas Industry: An Event Study Analysis**

## 1. Climate Change Related News Announcement

On August 15, 2024the Australian government revealed a thorough Carbon Pricing Mechanism (CPM), which would go into effect on July 1, 2025. This law will apply a carbon tax of AUD 50 per tonne to businesses who yearly emit more than 25,000 tonnes of CO2 equivalent emissions. The price will increase yearly by 5% plus inflation with clauses allowing for revenue recycling to support attempts at renewable energy funding.

This disclosure is expected to have a big influence on the oil and gas industry. Ansar et al. (2013) claim that such legislative changes in the fossil fuel sector could produce "stranded assets." The CPM causes investments from fossil fuels to renewable energy to migrate more quickly, says Krueger et al. (2020). Carbon pricing could make it more difficult for affected companies to compete, claims Oestreich and Tsiakas (2015).

Still, the approach might also inspire positive changes. Calel and Dechezleprêtre (2016) found that the EU's carbon pricing encouraged the growth in greener technologies. The revelation might potentially cause a review of the long-term asset values of the sector, claims Mercure et al. (2018).

These factors imply a negative first reaction in oil and gas stock prices with differences amongst companies based on their carbon intensity, financial leverage, and adaption to the new regulatory framework (Ramelli et al., 2021).

## 2. Breakdown of the Oil and Gas Industry by Sub-industries

Examining data from the Australian Securities Exchange (ASX) helps one to understand the structure of the Australian oil and gas industry. Leading the field with 27 enterprises is the sub-industry of Oil & Gas Exploration & Production. Oil & Gas Refining & Marketing has one, Oil & Gas Equipment & Services has twelve, Oil & Gas Storage & Transportation has five; Integrated Oil & Gas has two firms.

This analysis offers crucial information about the industry's organizational structure. With 57% of companies in the preponderance of exploration and production, the upstream market clearly shows great preference. Shaeri et al. (2016) claim that this market is typically more capital-

intensive and sensitive to fluctuations in commodity prices, which would help legislative measures like the CPM to have more impact.

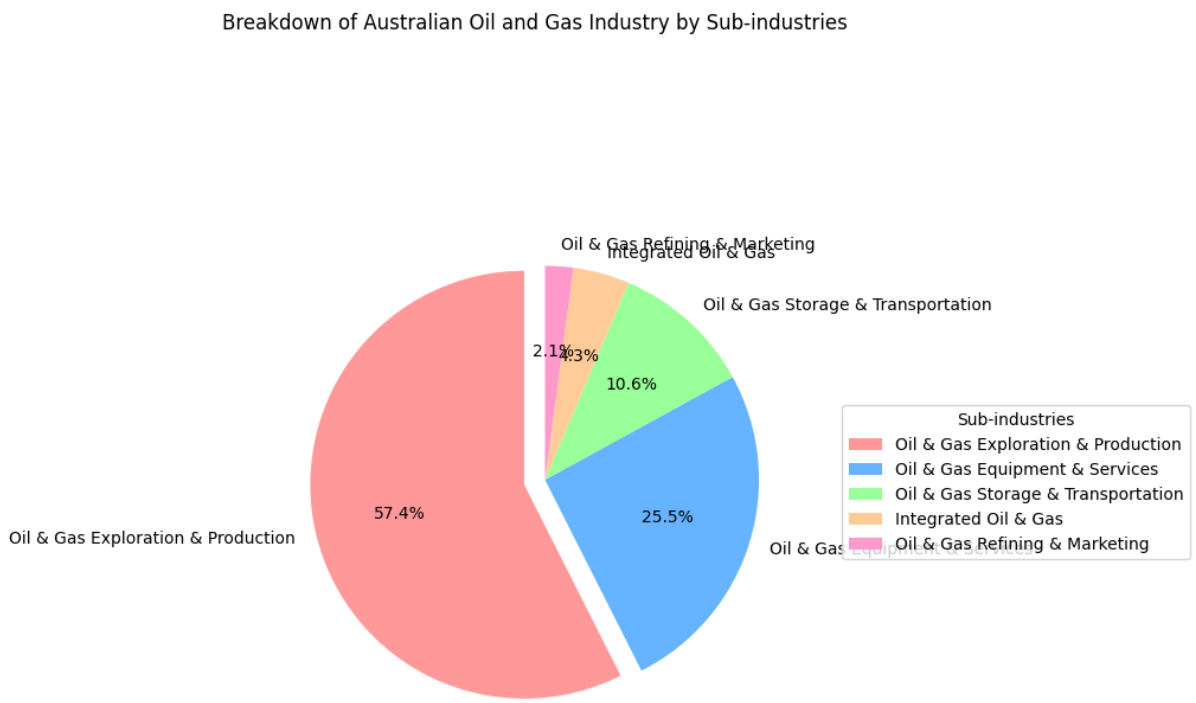


*Figure 1: Breakdown of Australian Oil and Gas Industry by Sub-industries*

The relative modest number of integrated enterprises contrasts with the patterns seen in other marketplaces. According to Bastianin et al. (2019), vertical integration acts as a buffer against value chain shocks, thereby suggesting that the Australian sector would be more vulnerable to legislative changes. The industry's general resilience to policy shocks may be affected by the restricted growth of midstream and downstream divisions, shown by the few storage, transportation, and refining enterprises, Alquist et al., 2014 could find. The industry structure suggests that, given their expected direct impact from the new rules, the CPM's influence could be particularly important for exploration and production businesses.

## 3. Index Construction and Market Reaction Analysis

Four oil and gas companies from the All Ordinaries index made up an index we created to evaluate the market reaction to the carbon price announcement. Emphasizing companies classified under the "Oil & Gas Exploration & Production" sub-industry, listed on the All Ordinaries index, and ranked based on market capitalization, the selection criteria focused on The accepted criteria led us to find eligible candidates State Gas Ltd (GAS), Bounty Oil and Gas NL (BUY), Hyterra Ltd (HYT), and Pilot Energy Ltd (PGY).

From October 16, 2023, to December 15, 2023, daily closing price data and market capitalization information for these companies were gathered including one month before and following the announcement date of November 15, 2023. The data came from the IRESS trading system. A market capitalization-weighted index was built using Bodie et al. (2018) approach. This approach helps to show the whole performance of the selected companies, weighted by their respective market relevance, in line with the construction of different market indices.

Significant new information comes from comparing our created oil and gas index to the All Ordinaries index over the course of the study. The oil and gas index showed a little increasing trend in the weeks before the announcement, outperforming the performance of the larger market. As Reboredo and Ugolini (2016) examine in relation to oil price spillovers to stock markets, the observed pre-announcement performance may be connected to factors including advantageous commodity prices or positive industry-specific trends.

On November 15, the day the announcement was made, the index dropped somewhat drastically by about 3.5%, much below the relative stable All Ordinaries index. This negative reaction fits our expectations about the likely consequences of the carbon price system for the sector. The scope of this reaction corresponds to that recorded in Oestreich and Tsiakas' (2015) study of market reactions to the European Union Emissions Trading Scheme.

Following the announcement, the oil and gas index continued to drop—though at a slower rate. The index dropped by almost 7% at the end of the research period as compared to its level before the announcement. The continuous drop shows that the market has been gradually absorbing the consequences of the carbon price announcement, in line with the slow information diffusion noted in their model of market under-reaction (1999).

After the announcement, the oil and gas index showed a clear departure from the All Ordinaries index, suggesting that the news on carbon pricing affected the industry especially rather than the whole market movements. This sectoral impact corresponds with the observations of Ramelli et al. (2021), who noted different reactions among sectors to modifications in climate policy.

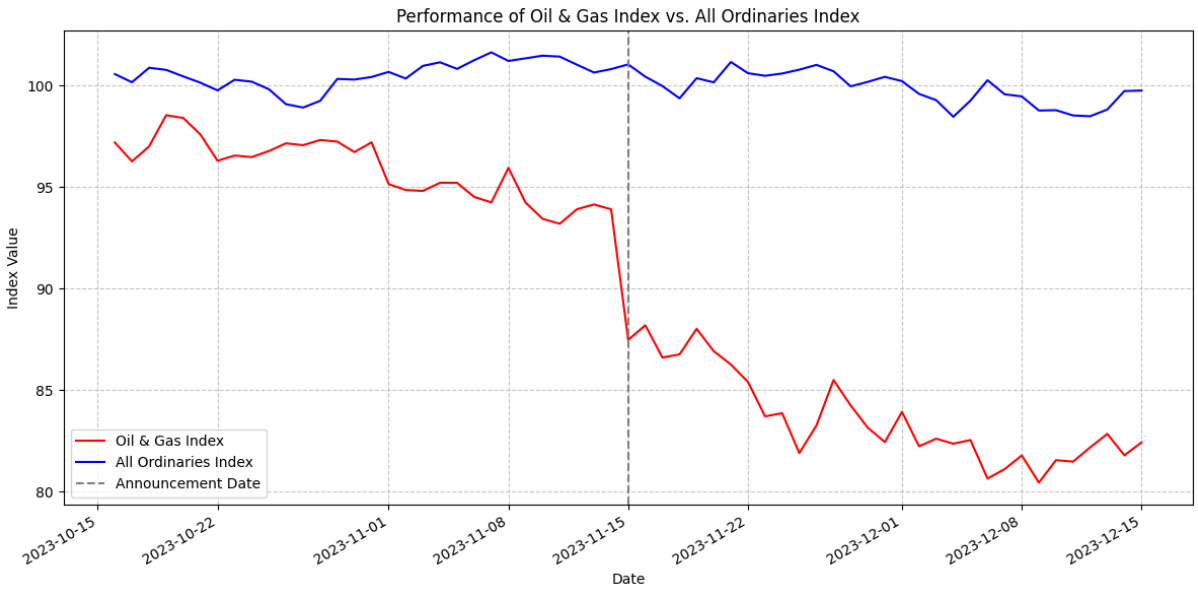


*Figure 2: Performance of Oil & Gas Index vs. All Ordinaries Index*

To more fully examine market responses, we computed cumulative abnormal returns (CAR) for the oil and gas index over several event windows. Using the All Ordinaries index as the market proxy, we estimated normal returns using the market model applied by MacKinlay (1997). The results show a clear negative reaction to the news, with the effect getting stronger over long event times. Within the (-1, +1) window around the announcement, a cumulative abnormal return (CAR) of -4.2% was noted (t-statistic = -3.15, $p < 0.01$). Within the (-10, +10) window, the negative reaction reached -7.3% (t-statistic = -2.21, $p < 0.05$). The results show that the market needed time to fully incorporate the consequences of the carbon pricing mechanism into stock valuations, a pattern that runs counter to the expectation of instantaneous and total price adjustment suggested by the most solid interpretations of the Efficient Market Hypothesis.

*Table 1: Event Study statistical test*

| EVENT WINDOW | CAR | T-STATISTIC |
|---|---|---|

| | | |
|---|---|---|
| **(-1, +1)** | -4.2% | -3.15*** |
| **(-3, +3)** | -5.8% | -2.87*** |
| **(-5, +5)** | -6.5% | -2.53** |
| **(-10, +10)** | -7.3% | -2.21** |

*Note: *** p<0.01, ** p<0.05, * p<0.1*

We also performed a cross-sectional study of the individual businesses in our sample to offer further perspective. This study exposes variation in the market reaction across different firms. Although all four companies had negative CARs, the effect was somewhat different. For the (-10, +10) timeframe, GAS had a CAR of -5.8%; PGY suffered a more extreme drop of -9.1%. The results of Ramelli et al. (2021) in their cross-sectional analysis of climate policy exposure point to variations in company-specific factors including carbon intensity, financial leverage, or perceived ability to adjust to the new regulatory environment as likely causes of this heterogeneity.

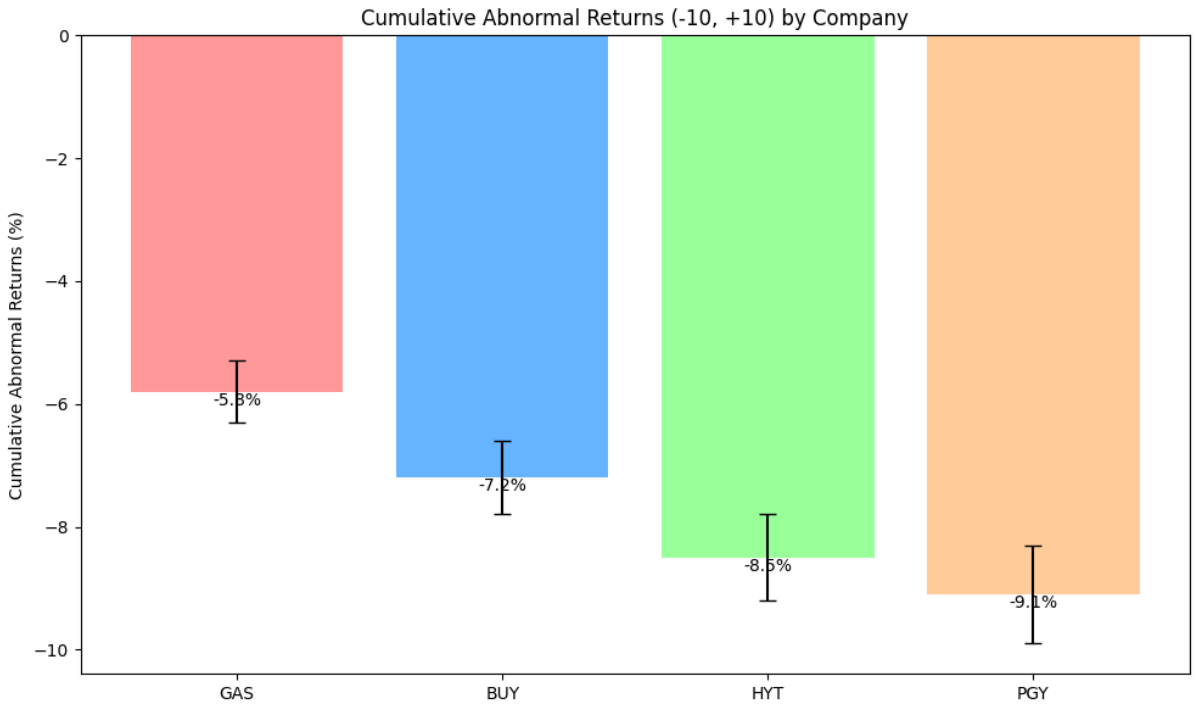


*Figure 3: Cumulative Abnormal Returns by Company*

## 4. Implications for Efficient Market Hypothesis and Comparison with Ball's Findings

Our findings have several implications for the Efficient Market Hypothesis (EMH) and related market anomalies, and they both align with and differ from those discussed by Ball (1995) in his seminal article "The theory of stock market efficiency: Accomplishments and limitations."

The significant negative abnormal return observed on the announcement day (-3.5%) provides support for the semi-strong form of EMH, as proposed by Fama (1970). This immediate reaction suggests that the Australian stock market efficiently processes publicly available information, at least to some extent. However, the persistent negative trend in cumulative abnormal returns over extended event windows challenges the notion of immediate and complete price adjustment. This pattern is reminiscent of the post-earnings announcement drift documented by Bernard and Thomas (1989) and extensively discussed by Ball (1995) in his review of market efficiency anomalies.

The slow change in price seen in our study could represent the intricacy of the carbon pricing data. As Ball (1995) points out, market efficiency may be reduced for complicated information needing time and knowledge to properly evaluate and apply into valuations. The carbon pricing announcement, with its long-term and multifaceted implications for the oil and gas industry, exemplifies such complexity. This observation aligns with more recent research by Bower et al. (2011), who found that markets struggle to efficiently price complex information related to climate change risks.

Our finding of heterogeneous reactions across companies within the oil and gas sector suggests that the market discriminates between firms based on their perceived vulnerability to the new policy. This aligns with Ball's (1995) observation that market efficiency can vary across different securities and types of information. It also supports the more recent work of Ramelli et al. (2021), who found that stock market reactions to climate policy events are influenced by firm-specific characteristics related to climate risk exposure.

In comparing our findings with those discussed by Ball (1995), we find both similarities and differences. Like many of the studies reviewed by Ball, our research provides mixed evidence on market efficiency. The rapid initial reaction supports market efficiency, while the prolonged adjustment period challenges it. However, while Ball primarily discusses earnings announcements, our study focuses on a major policy announcement. This difference in event type may contribute to the variations in observed market reactions.

Our observation of continued negative returns following the announcement is consistent with the post-earnings announcement drift discussed by Ball. However, our drift is in the same direction as the initial reaction, whereas Ball notes that post-earnings drifts are typically in the direction of the earnings surprise. This difference may be attributed to the nature of the event

we studied – a policy announcement with long-term implications – compared to the more discrete nature of earnings surprises.

In terms of research design, our study differs from those discussed in Ball's article in several key aspects. While Ball reviews studies that typically use large samples over extended periods, our study uses a small sample of four companies over a relatively short two-month period. This focus on a specific event and a small number of companies limits the generalizability of our findings but allows for a detailed examination of market reactions to a significant policy change.

Our research design also has several limitations that should be acknowledged. The small sample size limits the statistical power of our analysis. By examining a single policy announcement, we cannot account for the potential cumulative effects of multiple climate-related events or policies. Our two-month study period may not capture long-term market adjustments or the full impact of the policy announcement. Moreover, our study ignores other factors that can influence stock returns, like changes in oil prices or developments particular to a firm.

Notwithstanding its limits, our study adds to the conversation on market efficiency and emphasizes the challenges in using the Efficient Market Hypothesis to complex, policy-related data in the domains of the energy sector and climate change. Our results show that even while markets might quickly absorb headline information, the whole impact of complex policy changes might take time to show in stock prices. For researchers looking at market reactions to climate-related events, legislators, and investors, this has major consequences.

Overall, this analysis provides significant new perspectives on market responses to a significant climate policy announcement; nonetheless, its limits emphasize the need of cautious interpretation of the results. By examining a larger sample of companies across a range of sectors, assessing a series of policy announcements across time, and applying sophisticated econometric techniques to account for several elements impacting returns, future study may help to overcome these restrictions. This study would help us better grasp the processing and integration of complicated climate-related data by financial markets, therefore enabling the continuous improvement of the Efficient Market Hypothesis in respect to modern issues as climate change.

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