WORKING PAPERS ON
CAPITAL AS POWER

No. 2016/05

Disobedient Things

The Deepwater Horizon oil spill and accounting for disaster

D.T. Cochrane

August 2016

http://www.capitalaspower.com/?p=2103

Disobedient things: The Deepwater Horizon oil spill and accounting for disaster

D.T. Cochrane

Abstract.

Analysis of the Deepwater Horizon disaster and the accumulatory decline of BP demonstrates both the analytical efficacy of the capital-as-power (CasP) approach to value theory, and the irreducible role of objects in the process of accumulation. Rather than productivity per se, accumulation depends on control of productivity. Owners' control is over both the human and non-human components of systems of production, which transcend the standard categories of culture/politics/economics/technology. Capitalization translates the irreducible social order, things and all, that bear on accumulation into commensurable units of capital. The decline of BP in the wake of the disaster expressed the market's falling confidence in the obedience of the entities that bear on its profits, including the things that comprise its productive capacity.

Introduction.

Among the outcomes of the Deepwater Horizon disaster was a protracted and tumultuous decline in the market capitalization of BP, the majority owner of the Macondo well (see Figure 1). This decline emerged from the calculative translations by market participants of the qualitative events surrounding the disaster into the quantities of finance. The best explanation that standard theories of value can offer for such a decline is a 'distortion' of real value, which is situated in labour (Marxist value theory) or desire (neoclassical value theory). However, according to the capital-as-power theory of value (CasP), the decline of BP constitutes an assessment by market participants of a loss of power by the company. The originators of CasP, Jonathan Nitzan and Shimshon Bichler, have defined power as "confidence in obedience" (Nitzan & Bichler, 2009, p. 17). That means a loss of power occurs with a reduction in confidence or an increase of disobedience. These movements get translated into the commensurable values of finance through capitalization.

In this paper, I argue that things have to be included in our assessment of obedience and, in the case of the Deepwater Horizon disaster, things were among the disobedient entities. Things, individually and collectively, operated outside expected behaviour. This behaviour triggered a cascade of responses with wide-reaching qualitative effects, including the deaths of eleven men, the worst marine oil spill in history, widespread public outrage, numerous lawsuits and regulatory changes. All of these qualitative events had to be assessed by market participants in order to make quantitative sense of them.

As long as political economy defines value in terms of human labour it accedes to the bifurcation of humans and things that many sociologists, particularly in science and technology studies, have argued against (Knorr-Cetina, 1981; Latour & Weibel, 2005; Latour & Woolgar,

1985; Mackenzie, 1998; Miller, 1997; Slater & Barry, 2005; Swedberg & Pinch, 2008). Conversely, Nitzan and Bichler's analytical method is incompatible with the bifurcation as it assumes on-going quantitative translations that transcend the divide. The practices of price construction attempt to account for anything that might affect expected earnings with no differentiation between 'social' or 'natural' causes. Although attention is being drawn to the irreducible role of things in society, including in the domain of finance (Knorr-Cetina & Bruegger, 2000; Mackenzie, 2008; Muniesa, 2008; Preda, 2008), that irreducibility has not been explored in the context of accumulation. Through my analysis of the Deepwater Horizon disaster and the accumulatory decline of BP, I intend to demonstrate the analytical efficacy of the CasP approach to value theory, as well as the irreducible role of things in the process of accumulation.

The drastic decline in the capital values of BP – and other firms – as the disaster unfolded is unsurprising. There was no doubt that BP's future included fines and lawsuits. As the disaster grew from an explosion on a drilling rig to an undersea oil leak of unprecedented proportions, the company's very existence was called into question. In that context, it is obvious that shareholders would seek to unload the company's shares. To do so, the shares had to be offered at ever lower prices to attract buyers. In the course of making these trades, market participants constructed a price. However, in assigning meaning to these prices both mainstream and critical political economy exclude the construction process. The meaning of these prices is narrowly conceived in terms of productivity. Yet, only a small portion of the decline in BP's valuations could be assigned to the disaster's effects on the company's productive capacity or output. According to standard value theories, the rest of the decline must be deemed 'non-economic.'

In contrast, CasP makes the price-constructing process central to the meaning of capital values. Rather than a representation of underlying productive capacity, capital values express an

assessment by market participants of a capitalized entity's power, of which productive entities are only a part. Government policies, consumer trends, technological changes and big weather events, among many other agents, can all be assessed and translated into the prices of capital. As such, there is no 'economic' and 'non-economic' distinction to be made. Adopting Bruno Latour's conception of irreduction (1993), I argue that financial values become the homogenizing measure of the irreducible, heterogeneous entities that comprise owners' matters of concern.

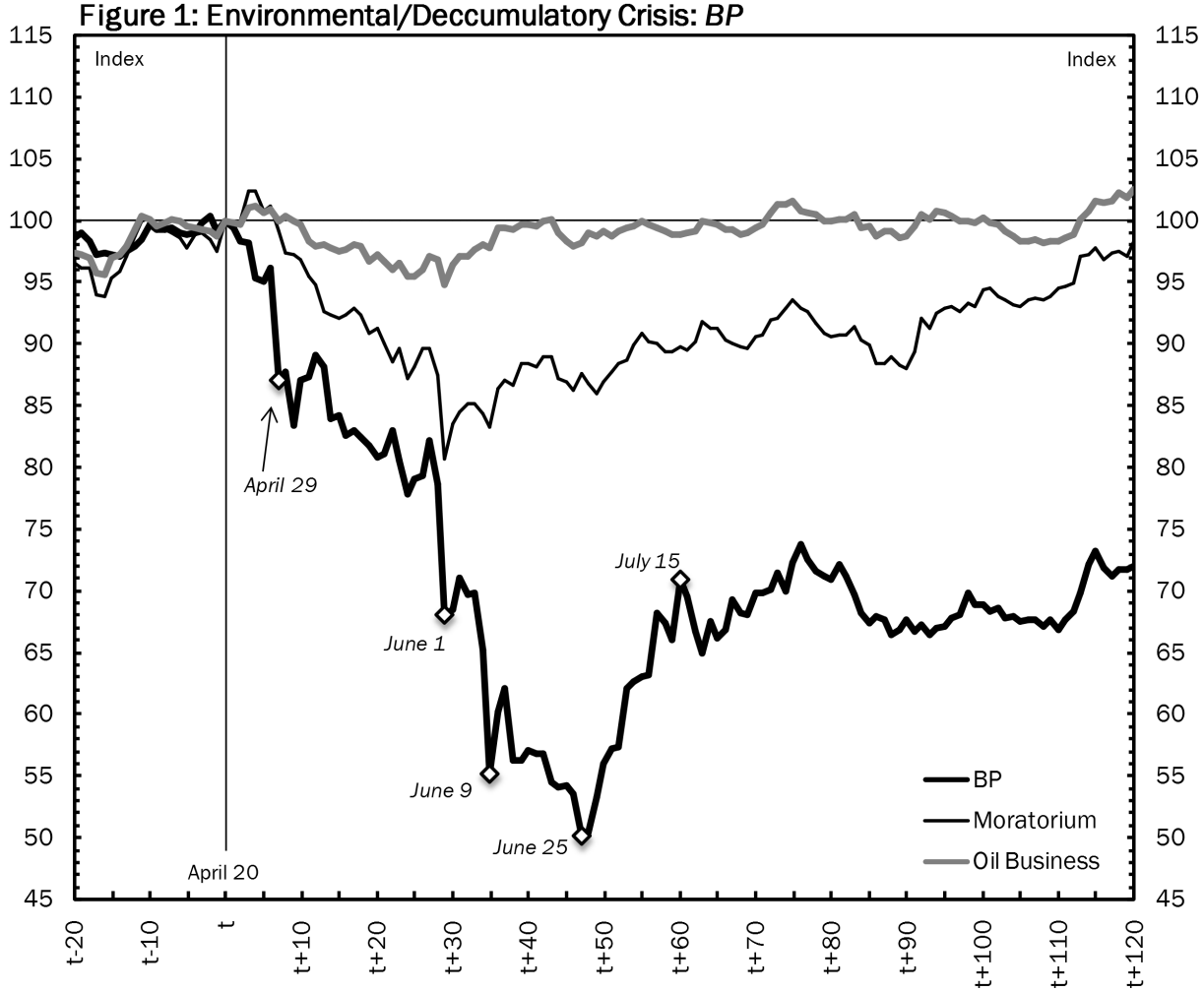
The removal of productivity from the core of capital valuation is not a removal of productive entities altogether. However, their role in valuation needs to be reconceptualized and resituated. The construction of capital values is a translation of information about the complex, enfolded social order. That translation takes place along myriad intersecting metrological chains (Latour & Lepinay, 2010). Systems of production, such as oil rigs, are ensnared within the web of quantification. However, there is a great deal aside from their productivity that will be taken into account, not least because their productivity is not independent of the prices they inform. Increased oil rig efficiency ought to increase their value. However, increasing the output of oil will reduce its price, lowering the value of the increasingly productive oil rigs. Therefore, oil output needs to be carefully controlled to bolster profitability (Nitzan & Bichler, 2009).

It is that control of productivity, termed 'sabotage' by early 20th century political economist Thorstein Veblen (1921), rather than productivity per se, that is the mechanism and object of accumulation by capitalists. Hence, Nitzan and Bichler's claim that capital *is* power. My argument is that capitalist control is contingent not only on the human components of productive entities but also on the things involved in the process of production. Productivity is an emergent quality of the worker-object assemblages that comprise productive entities. It cannot be

ontologically reduced to human and non-human component parts. In other words, it is irreducible. When the valuation process constructs a price it does so on the basis of an assemblage's overall productivity, putting most of the worker-objects involved into a 'black box.' However, when a crisis emerges, as in the case of the Deepwater Horizon disaster, market participants — and others — will open the black box and assess particular impacts on expected profits and perceived risks. Both humans and non-humans will be subject to this assessment.

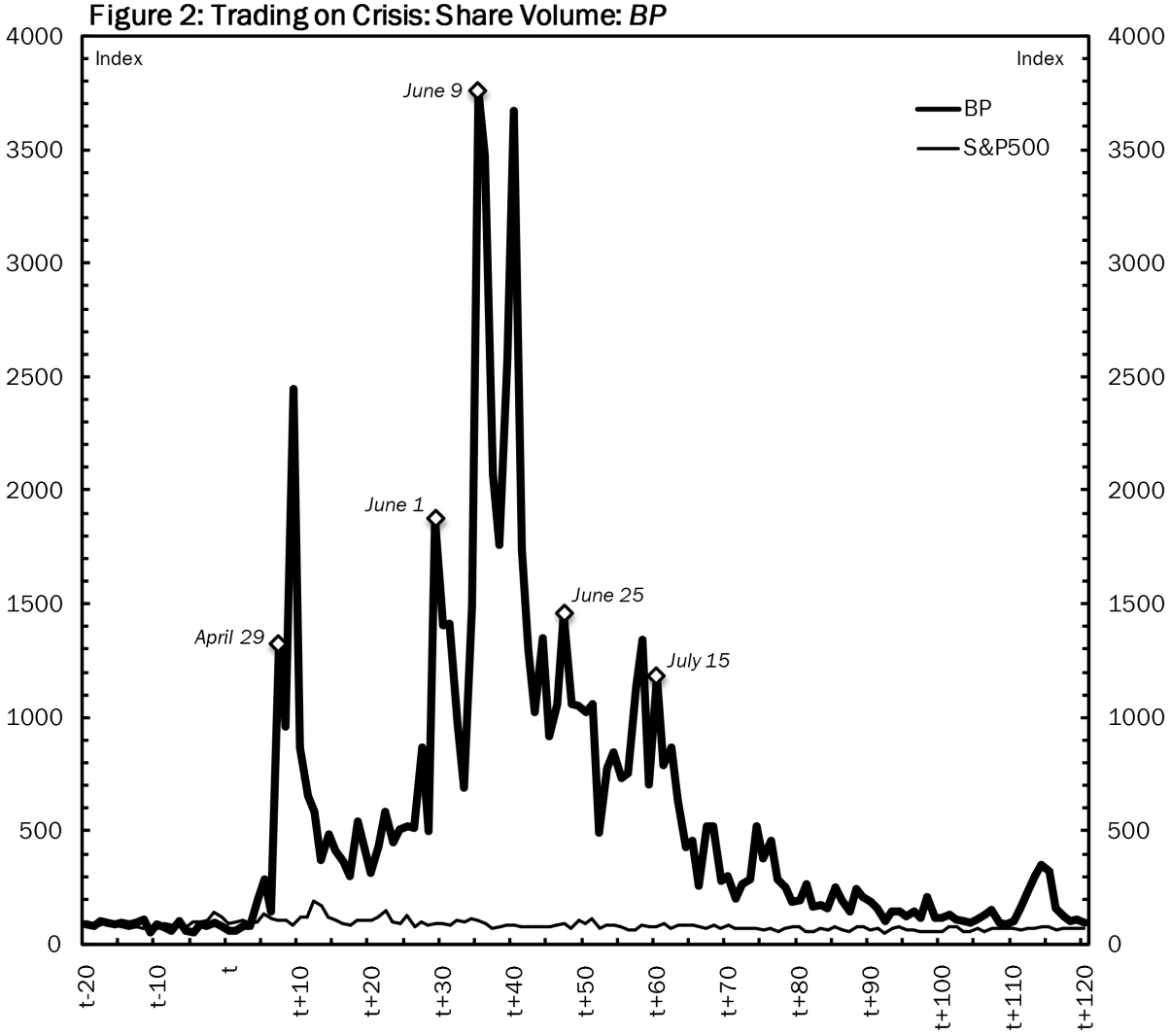
Power, as deployed in the CasP approach, does not explain constructed prices. Rather, conceiving of capital values as the market's assessment of capitalists' power enables analytical insights in need of explanation. As such, CasP should be considered an analytical method rather than an explanatory framework. It highlights that which needs to be explained. So conceived, we bring into the analysis of business activities Foucault's insistence that the "mechanics of power" should be analyzed in "its specificity, its techniques and tactics" (Foucault, 1980, p. 116). What the CasP framework adds to this perspective is recognition that the possessors of power are also obsessively assessing their own power. The assessment informs subsequent activities intended to maintain and expand that power. CasP facilitates movement beyond the common, widespread recognition of social asymmetry to identifying the topological shifts in that asymmetry. With the asymmetries identified, we can begin to answer the question: "where do they come from and what are they made out of?" (Latour, 2005, p. 64). I argue that the decline of BP expressed the market's falling confidence in the obedience of the entities that bear on its profits, including the things that comprise its productive capacity.

Figure 1: Environmental/Deccumulatory Crisis: *BP*



t = April 20, 2010, the day of the accident.
DATA: Centre for Research in Security Prices. Series calculated by author.
NOTE: Data points are indexed differential market capitalization (relative to S&P500; April 20, 2010=100).

Figure 2: Trading on Crisis: Share Volume: *BP*



t = April 20, 2010, the day of the accident.
DATA: Centre for Research in Security Prices. Series calculated by author.
NOTE: Data points are trading volume indexed relative to average volume for 2009.

The Quantities and Qualities of a Disaster.

Quantifying human life in financial terms is widely considered crude and ethically objectionable. Yet, it is done all the time. For example, the fund established for the families of victims of 9/11 had three measures to establish payments: 1) financial loss; 2) set amounts for pain and suffering; 3) subtraction of life insurance paid. The first metric meant the lives of well-paid victims were valued more highly than those of poorly-paid victims. The high-profile of the differential among payments provoked outrage, but the act of valuing lives was accepted as a necessity of our thoroughly monetized society.

Eleven men lost their lives in the Deepwater Horizon disaster.[1] Within moments of the disaster, calculations were being made, including expected liabilities for the lives of these men. In addition to this calculation, calculations would have been made about the probable distribution of liability, since the rig was being operated by the oil services company Transocean on behalf of BP. The explosion occurred at 9:45PM. None of the markets listing BP's shares — New York, London and Frankfurt — were open. Nonetheless, market participants would have been speculating on the possible costs to the company and anticipating the reaction of their fellow participants. The probably costs would reduce expected earnings and could increase the risk to earnings. The speculations of others would be greater or less than those of any particular participant. All had the same goal – market-beating returns – but would generate a range of valuations that would have to enacted through buying and selling.

In the early stages of the disaster, its scope was not well understood. There had been a blowout, the drilling rig was on fire and the deaths were reported with uncertainty. The continued fury of the flames indicated the blowout preventer (BoP) had failed. However, no one

[1] Jason Anderson, Dewey Revette, Aaron (Dale) Burkeen, Donald Clark, Stephen Curtis, Roy (Wyatt) Kemp, Karl Kleppinger, Shane Roshto, Adam Weise, Keith Blair Manuel, and Gordon Jones.

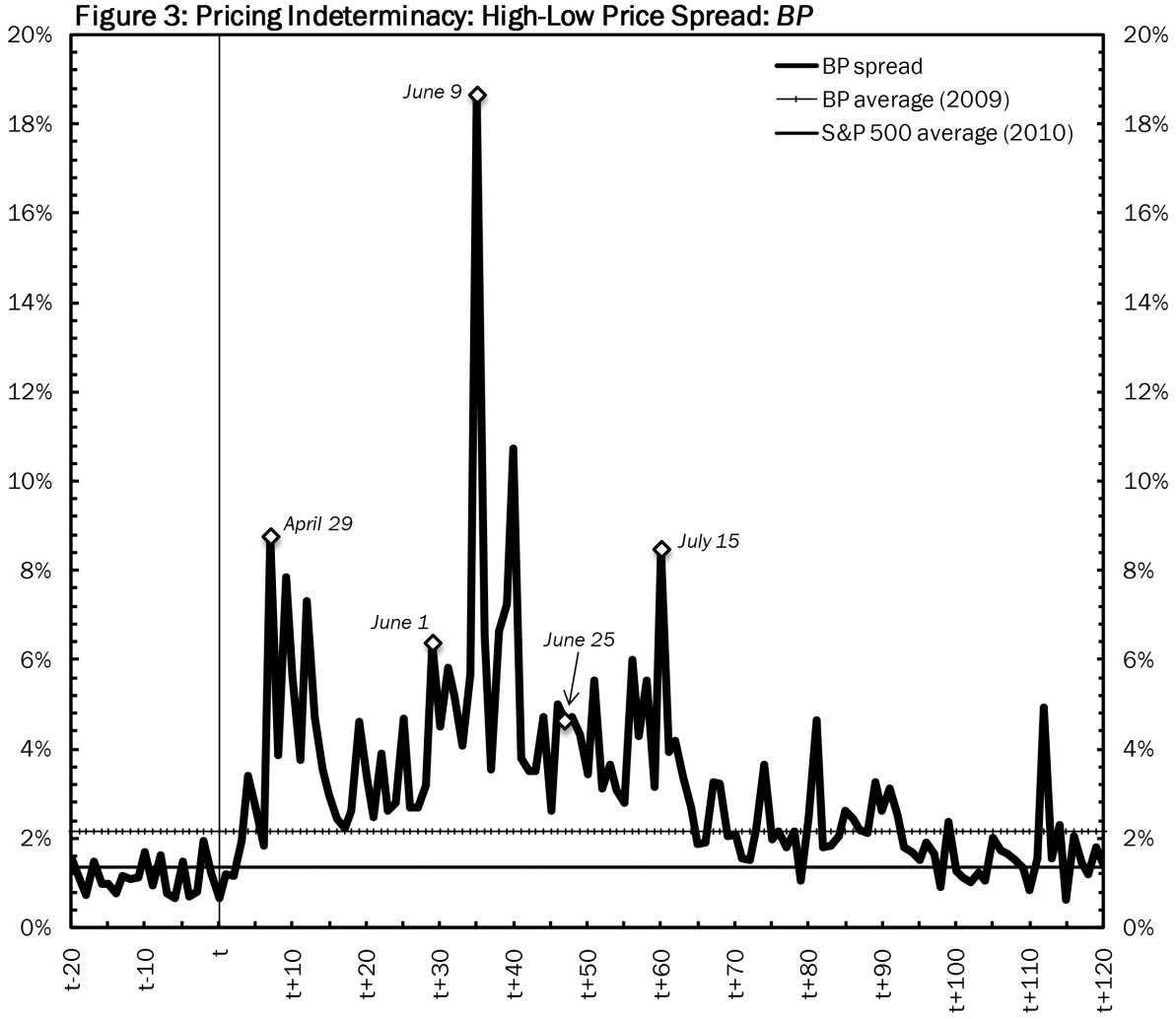
could know that the rig's eventual sinking would result in an unprecedented spill. The early uncertainty meant the early calculations had very little effect on the valuation of BP. Any single event can be difficult to discern in the movements of a large transnational corporation, since the translations are accounting for on-going processes and events around the world. One disaster, as unfortunate as it was, on one drilling rig is a fairly minor event relative to BP's global operations. The volume of trading of BP shares would not reach an unusual level until April 26, the Monday following the disaster, despite the fact that the vessel sank on April 22 and the leak was announced on April 24 (Figure 2). In the first four days after the disaster, the value of BP shares only declined five percent relative to the S&P 500 (Figure 1).[2]

The initial increase in trading activity saw daily volumes double relative to average 2009 volumes. Of course, not everyone was bidding the value down, since each seller required a buyer. In fact, the divergent assessments of the event are evidenced by the large spread of daily high-low trading values relative to the closing price. By the end of the trading day on April 28, the value of BP had actually recovered one percent of its pre-disaster value. Those who expected the value of BP to recover out-bid those who expected it to decline further. That changed drastically on April 29. BP opened down one and a half percent from its close the night before, and then lost another six percent. Although this decline is modest compared to the eventual loss BP's valuation would take, market activity increased markedly at 13 times the company's usual trading volumes. Just over a week after the explosion, and a week after the sinking of the Deepwater Horizon, the divergent calculations of market participants rendered extreme price volatility (Figure 3). Over the next week the company's market capitalization would fluctuate wildly between seven and twenty-two percent below its pre-disaster value. During that week,

[2] As per the CasP analytical standpoint on accumulation as a differential process of redistribution, all descriptions of capital values are relative to the S&P 500, which serves as a benchmark for 'capital in general.' This perspective will be described in more detail below.

BP's daily high-low spread averaged six percent its closing price, compared to a 3.6 percent spread of the S&P 500, expressing the efforts of market participants to calculate the future of an on-going, indeterminate event.

Figure 3: Pricing Indeterminacy: High-Low Price Spread: *BP*



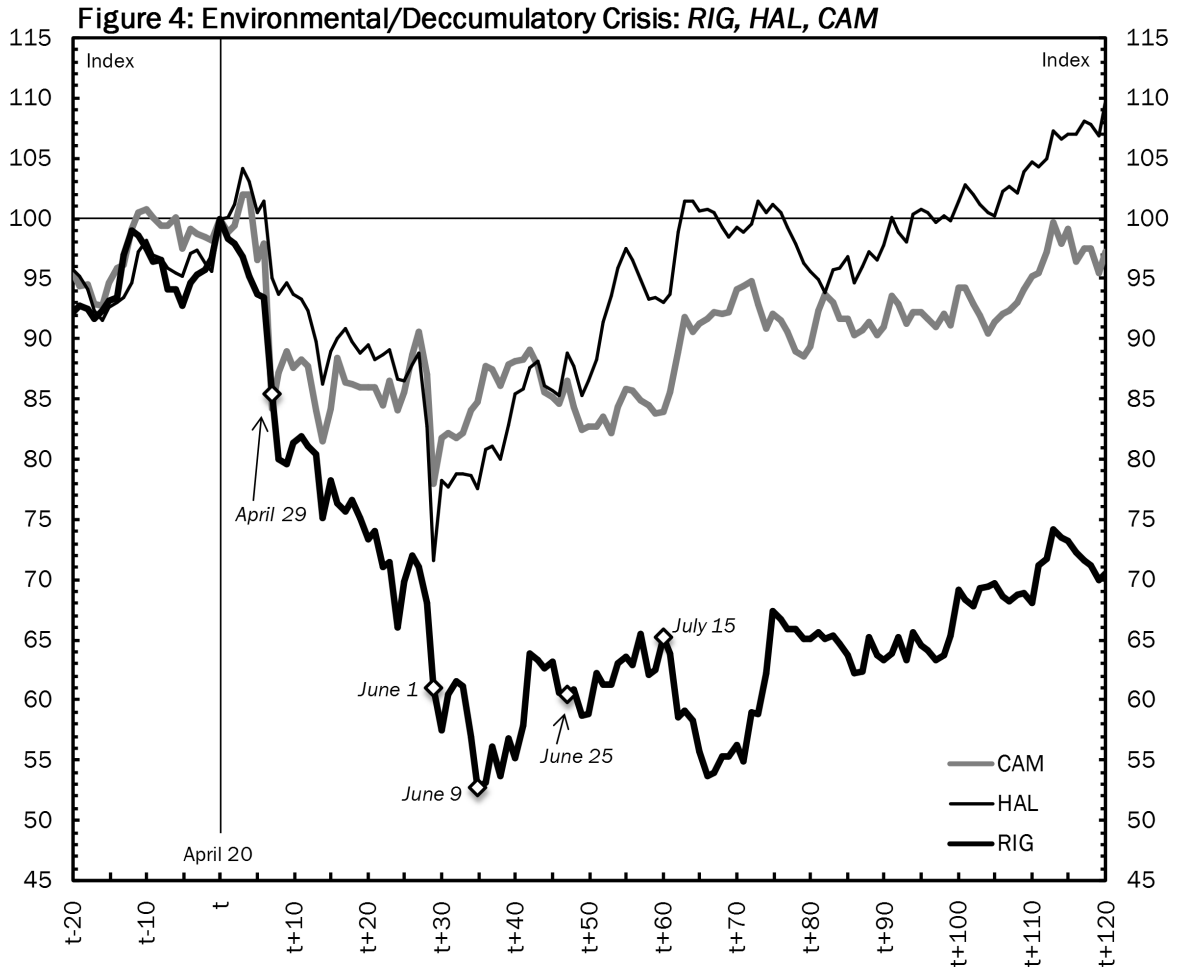
t = April 20, 2010, the day of the accident.
DATA: Centre for Research in Security Prices. Series calculated by author.
NOTE: Data points are daily high-low spread as a percentage of the closing price.

This volatility moved around a precipitous, but not continuous, decline. On May 3, BP was 17 percent below its relative pre-disaster value, while the S&P 500 had changed by less than one percent. By June 1, BP had lost 32 percent of its relative value, shedding thirteen percentage

points over the prior weekend. Its most volatile day would be June 9, with trading volumes 37 times greater than usual, an 18 percent spread between the day's high and low, and the largest one-day decline in closing value of fifteen percent. The bottom would come two weeks later, on June 25, when BP's market capitalization would be just over half its pre-disaster value. The trading volume and high-low spread for that day were much reduced from the high volatility from two weeks early. There was a much tighter consensus among market participants about where the price of BP ought to go.

Over the next twenty days, the company would recover about 20 percent of its relative pre-disaster value, effectively returning to the value established on June 1. BP's capitalization would fluctuate around this relative value for over a year and a half. It would take until the end of August for both trading volumes and daily price spreads to return to relatively stable levels.

BP was not the only corporation whose capitalization was negatively affected by the disaster. Rig operator Transocean (RIG), as well as Halliburton (HAL), which manufactured and poured cement used in the well, and Cameron International (CAM), the manufacturer of the Deepwater Horizon, all saw sharp relative declines in the first weeks of the disaster (Figure 4). RIG, in particular, saw substantial, lasting losses. Notably, the significant points for these three firms do not perfectly align with those of BP as different calculations had to be made to account for the effects of the unfolding event on the various companies.



t = April 20, 2010, the day of the accident.
DATA: Centre for Research in Security Prices. Series calculated by author.
NOTE: Data points are indexed differential market capitalization (relative to S&P500; April 20, 2010=100).

For example, both CAM and HAL reached their lowest differential value post-disaster on June 1. The next day, both corporations bounced back, with HAL undoing its entire differential decline barely 60 trading days after the disaster. CAM took considerably longer to return to its pre-disaster differential value. RIG, like BP, remained well below its pre-disaster value.

Importantly for my account, other members of the oil and oil services industries also had relative declines, particularly those active in the Gulf. Figure 1 includes a series for the broader oil business and one narrowed down to companies in the oil industry significantly affected by the

U.S. moratorium on deep water exploration in the Gulf of Mexico, enacted on May 30, 2010.[3] After a brief increase relative to the S&P 500, both categories of companies saw a marked decline. Like CAM and HAL, both saw their nadir on June 1, the first trading day after the U.S. government announced the drilling moratorium. The non-BP oil business would return to its relative pre-disaster value by June 10. Market participants seemingly anticipated that any effects of the disaster on oil business profits would not extend to the entire field of companies. Unsurprisingly, the companies affected by the drilling moratorium would continue to feel the calculative effects of the disaster into October, 2010 when the ban was lifted on deep water drilling in the Gulf.

The explosion on the Deepwater Horizon occurred when a 'kick' in the Macondo well – ominously named after the ill-fated town in Gabriel Garcia Marquez's One Hundred Years of Solitude – resulted in hydrocarbons entering the riser that stretched between the drilling rig and the wellhead that sat on the floor of the Gulf.[4] Once the hydrocarbons reached the drilling rig, they spread to the engine room and were ignited. The fire was fed by the hydrocarbons that continued to flow from the riser. At this point, the automated deadman mechanism on the BoP should have been triggered, clamping the well shut, stopping the flow of hydrocarbons and making it easier to extinguish the flames. However, for reasons that were unclear at that point — and debated in the courts long afterward — this did not happen. Once the Deepwater Horizon lost power, the dynamic positioning system that kept the rig in place above the wellhead stopped

[3] 'Oil Business' includes companies, other than BP, 1) classified under SIC13: Oil & Gas Extraction, SIC291: Petroleum Refining, SIC3533: Oil & Gas Field Machinery & Equipment, SIC46: Pipelines, except Natural Gas and SIC517: Petroleum & Petroleum Products, 2) valued at $1 billion or more on April 20, 2010, and 3) data for every day included in the chart. 'Moratorium' is companies in 'Oil Business' that saw a decline of five percent or more on June 1.

[4] The information in the qualitative description of the disaster is taken from several reports on the event and its aftermath as well as news reports. These include BP's investigative report (2010) and the President's Report from the U.S. National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling (2011).

operating. With the vessel adrift, the riser stretched and buckled, likely initiating the leak. When the rig sank, the riser collapsed, resulting in a number of leaks along its bent, twisted length.

Over the next two and a half months, the well uncontrollably gushed millions of barrels of oil from the well. There was a great deal of initial uncertainty about the scale of the leak. Partially, this was because the hydrocarbons were flowing out of several fissures in the collapsed riser. The first estimated flow rate was 1,000 barrels a day (b/d). On April 29, this was increased to as much as 5,000 b/d. By June 19, the Flow Rate Technical Group, which was organized for the sole purpose of providing an estimate, suggested the oil was flowing at 35,000 to 60,000 b/d. The final estimate that would establish the total size of spill, was an average of 53,000 b/d, with an initial flow of 62,000 b/d that dropped off as the reservoir was depleted and its pressure lessened.

BP undertook several failed efforts to capture the oil and stop the leak. The first response was the use of a remote operated underwater vehicle to trigger the BoP. However, the BoP did not respond. Next, BP attempted to place a custom made containment dome over the leak, with a spigot on top through which the hydrocarbons were to be diverted and captured. This failed when the hydrocarbons coming into contact with the dome crystallized, blocking the spigot and causing oil and gas to spill out the bottom. We might say that the hydrocarbons refused to obey the material order imposed by the containment dome. When that disobedience was publicly announced on May 10, BP's value fell by almost five percent. That decline undid most of a seven percent increase in the days leading up to the lowering of the containment dome. Had the crystallization not occurred and the oil been successfully captured, BP's quantitative decline would almost certainly have been much less.

The company also tried a 'top kill,' which involved pumping heavy drilling mud into the well in an effort to staunch the flow of oil and gas, after which cement would be pumped to seal the

well. A last ditch effort as part of the top kill was the 'junk shot,' which involved sending small pieces of rubber into the well to plug it up. These failed, in part, because BP was reluctant to ramp up the pressure pumping owing to questions about how obedient the surrounding rock could be. Although the engineers and other officials involved were confident the rock would obey an order translated into a certain magnitude of pressure, there was concern it might defy an order accompanied by higher pressures. If the rock formation cracked, then hydrocarbons could escape from multiple, widely distributed places on the seabed. Such leaks would effectively be uncontainable and could leak for years. Such an event could have bankrupted BP and brought intense scrutiny of the entire oil drilling business since questions would proliferate in response to such an incredible disaster.

BP seal the well on July 15 with a custom made cap that attached tightly to the BoP. While short-term closure efforts were being made, BP was also drilling two relief wells that intersected with the original well. Drilling mud and cement were pumped into these relief wells to permanently seal up the leaking well. On September 19, the well was declared "effectively dead."

As the leak was occurring, BP made efforts to collect some of the hydrocarbons spewing from the well. At most, the company was able to recover half of the flow. To deal with the oil on the surface of the Gulf, the company used chemical dispersants. Dispersant breaks up the oil, causing it to sink below the surface. Some critics have speculated that this was not the best environmental course of action, but rather undertaken as a public relations effort, since it would eliminate the oil from view. Although there are no clear traces of how these efforts translated into the company's capitalization, market participants were watching. Success or failure would be assessed and translated into decisions to bid share prices up and down.

Although it is taken for granted that a relationship exists between the quantitative movements and the qualitative events, the actualities of that relationship are unclear. The purpose of the trades that moved BP and other corporations' capitalization is largely beyond dispute: accumulation. However, the process of price construction is an opaque one, in part because, on the one hand, mainstream political economic theory has conceived of stock markets as perhaps the ultimate example of the invisible hand, where supply and demand converge to realize a fair and rational price. Most critical political economy, on the other hand, has focused on the 'real' economy, conceptualizing financial markets as a realm of fictional representations and dangerous speculative behaviour. As a result of these two dominant perspectives, the actual practices of pricing capital have been under-considered.

Part of the difficulty lay in the disparate positions occupied along a simple-complex gradient by the quantitative and the qualitative. As complex as market mechanisms may seem, they generate perhaps the simplest of all entities: a single number. For most stocks that number continually changes, but it remains a single number. When the markets close on any given day, a value has been assigned to every stock traded, which attaches a price to each corporation. Yet, each of those corporations is comprised of an incredible array of seemingly incommensurable entities. How does one price BP when it consists of a head office in London, staffed by technical experts, accounting clerks, human resources personnel, office administrators, and executives? To that, is conjoined hundreds of wells and service stations around the world. The company sub-contracts much of the actual drilling work and leases its name to franchisees operating service stations. It has proven oil reserves, refinery capacity and marketing campaigns. BP engages in R&D that generates technologies and alters the practices of oil exploration, extraction and refinery. BP also lobbies governments that pass laws concerning resource extraction,

environmental protection and worker safety that will affect the profitability of the company's operations. Despite the globe-spanning array of entities comprising BP, just a small swath of which are described here, at the end of each day, BP bears a single value.

The magnitude of the Deepwater Horizon disaster actually allows us to connect specific events to drastic price movements of one of the largest corporations in the world. We know that speculation about the size of the oil spill would have been of great interest to market participations, since it would be used in the calculation of a fine to be levied on BP. If government spokespeople had said that the spill was much smaller than initially estimated, the price of BP would have risen. That rise would not just happen as a necessary, rational outcome. Rather, market participants would bid the price up. When, on the other hand, the flow of the leak was continually ratcheted up, the value of BP continued to fall, pushed down by the recalculations of market participants.

When the 'top kill' failed on Saturday, May 29, and the Gulf drilling moratorium was announced on May 30, BP's share opened on Monday, June 1 down 13 percent from their Friday close. The shares of other explicity implicated firms – RIG, HAL and CAM – also fell, as did the broader oil business. Whatever else might have been happening in the sphere of BP's operations was dwarfed by the failure of this high profile effort and the U.S. government's actions. Traders mobilized shares at 19 times their usual volume, although price movements were only at three times the usual high-low spread. Yet, how these calculations were actually made is unknown. We can connect the capping of the well on July 15 with 12 times the usual trading volume, four times the usual high-low spread and the return of almost five percent of BP's pre-disaster value. However, how market participants arrived at this value is unknown. What is needed is a

retheorization of capital and accumulation that accounts for the pricing process itself. My contention is that pricing accounts for both things and humans as consequential mediators.

Retheorizing Capital & Accumulation.

The accumulation of capital is widely understood to mean an increase in productive capacity. These gains are measured in nominal financial quantities which, according to both Marxist and neoclassical political economy, constitute a distorted representation of the real, underlying value of capital. Problems with this productivist conception of capital and accumulation, both analytical and theoretical, have long been identified and they were once the subject of heated theoretical debates (see Nitzan & Bichler, 2009, pp. 67-124 for a summary of these criticisms).[5] Unfortunately, the response to the problems has been the eschewal by political economists of critical engagement with the concepts, despite their key role in all political economic frameworks.

The fundamental theoretical criticism of the standard conception of capital is an ontological one. It requires that 'real' capital, i.e. productive capacity, have an underlying quanta that makes its qualitative diversity commensurable. In other words, a vineyard, a tannery, a missile factory, a wind turbine, and all the rest of the heterogeneous material complexity of our systems of production, have something within them that can be agglomerated in the process of accumulation. This is true of both Marxist and mainstream theories of capital. We can think of the standard theoretical conception as a 'dual quantity' approach: observable quantities represent unobservable quantities, bypassing qualities. Much analytical energy has gone into converting

[5] The Cambridge capital controversy, involving economists at MIT facing off against economists at Cambridge University, was the most high-profile debate about the nature of capital. Among the combatants were Paul Samuelson, who defended the neoclassical conception, and Joan Robinson, who poked substantial holes in the concept. See (Cohen & Harcourt, 2003; Hodgson, 1997) for a history of the controversy.

nominal quantities into these postulated real quantities (for example Shaikh & Tonak, 1994). Now, however, that laudable project has been largely abandoned and most critical political economists simply use the problematic national accounting statistical calculations of 'real' quantities, exemplified by real GDP (Stiglitz & Sen, 2009).

The CasP theory of value revisits the concepts of capital and accumulation and reconceptualizes them without the real-nominal dichotomy. Rather, observable financial quantities, the ones that capitalists engage with every day, and which have earned a prominent place in Western media, both in the daily coverage of changes in stock market indices, and reporting on notable financial events, are treated as consequential in their own right. Although CasP gives these values a representative function, that representation is not merely reflective of an objective reality. Rather, the representation is *poetic* in the sense given by Elie Ayache (2010): the buying and selling of traders *brings forth* a price (p. 10). Those prices become actants added to the world that have consequences overlooked by productivist political economy.

Within CasP, the capitalization formula is the ultimate translational mechanism of capital. The basic calculation of capitalization is:

$$k = \frac{\pi_e}{\beta \cdot r},$$

where k is the present value of capital, π_e is expected profits, β is a risk coefficient, r is the normal rate of return. The calculated value discounts expected profits by the uncertainty of those profits, and the expected returns from a safe asset, such as U.S. T-bills. This value can be calculated for a machine, a factory or an entire corporation. Capitalization is used by banks when they offer credit, by hedge funds when they identify a takeover target, by manufacturers when deciding whether to repair or replace a piece of machinery. The calculative mechanism for

publicly traded corporations is the buying and selling of shares. Regardless of the complexity of an asset, whether a painting or an entire corporation, capitalization makes it possible to assign a single value.

One of the most important insights of CasP is that the value of capital is forward-looking. Marx conceptualized the value of capital as the 'dead labour' included within it. Therefore, within the labour theory of value, the price of a piece of machinery represents the previous labour expended in its manufacture. Capitalization, however, is calculated using the expected future stream of earnings. It is the future, not the past, that is expressed in the value of capital. Or, rather, it is the capitalists' vision of the future, translated into the quantities of finance. This means that the capitalist vision of the world can be found, in part, by understanding the calculative process of value construction.

The qualities being accounted for in the calculations of value are much broader and more diverse than just the labour involved, although labour is undeniably important. Anything and everything that market participants believe could affect future profits will be translated by the calculation of capital values. Government policies, consumer trends, resource access, protest movements, community norms, product hype and much more will be taken into account – literally. This fact is one that 'everyone knows.' However, it is an uneasy reality at odds with standard political economy, not least because it obliterates the divisions between the economy and the other segments of the social order. Production cannot be isolated as a privileged domain functioning free of these relationships. Both production and pricing are affected by non-economic processes since engineers and traders alike take account of these relationships.

Stand alone financial values have no meaning in and of themselves. While early political economists tried to discern the meaning of financial quantities according to the perceived

underlying real quantities, Nitzan and Bichler emphasize the relational meaning between financial quantities. Namely, accumulation is not meaningful in absolute terms by reducing nominal quantities to real ones, but rather in differential terms. Capitalists care less about an absolute gain than 'beating the average.'

If a company's share value grows by ten percent, while its sectoral competitors grow by 15 percent, that is a differential decline. Conversely, if the company endures a five percent drop in value, but its competitors drop by seven percent, they achieved a differential gain. Capitalists assess their successes and failures not against any absolute register, but against continually changing benchmarks that average across various segments and sub-segments of the corporate world. This insight into the differential nature of accumulation should be uncontroversial, as benchmark comparison is commonplace in popular business writings and familiar to most people who engage with political economic issues.

Nitzan and Bichler's central theoretical claim is that the differential measure of capitalization is an expression of the relative power of capitalists, and differential accumulation charts the redistribution of that power. Again, this is the capitalists' own understanding of the power of themselves and their brethren. Capitalization occurs via market participants' translation of the world as it bears on what Nitzan and Bichler refer to as the 'elementary particles' of capitalization. Differential accumulation occurs when that assessment favours one asset over another. Rising oil prices may mean greater profits for Exxon, but higher transportation costs for Wal-Mart. Increased royalties on copper in Chile would be bad for transnational mining company Freeport-McMoRan, but of little consequence to Coca-Cola. Unrest in Cameroon might mean higher cocoa costs for The Hershey Company, but new defence contracts for BAE Systems.

As noted above, Nitzan and Bichler have defined power as 'confidence in obedience.' Resonant with a Machiavellian conception of power, capitalist power exists as potential rather than in action. A government is powerful when its populace is pliant, not when it must deploy the army to quell unrest. A corporation is powerful when all that bears on its earnings unfolds predictably. That means the power of capitalists exists in their control over diverse parts of the broad social order, including, but not limited to labour. Accumulation occurs when they can either increase the confidence of market participants that those parts will behave according to expectations, or when more of the social order is rendered obedient. While the word obedience connotes human-human relations, I am drawing on the insights of actor-network-theory and science and technology studies to argue that things have to be included in our understanding of obedience, corporate power and accumulation.

Things and the Growth of Capitalized Entities.

Although machines have played an important role in political economic theory, they have been rendered by the theorists into what Bruno Latour calls 'intermediaries' (Latour, 2005). They "transmit meaning or force without transformation" (p. 39). According to the standard value theories, machines provide a relay for the flow of value from labour to capitalists and/or consumers, but they are given no difference-making capacity of their own. This is a feature of the dual quantity perspective of both Marxist and mainstream value theory: visible quantities represent hidden quantities. Within these theories, the passage of 'real' quanta through the qualitative world to become nominal quanta distorts them, but leaves them fundamentally unchanged. While theorists acknowledge that machines perform a qualitative transformation on the materials that pass through them, they do not allow for machines to contribute quantitative

meaning. According to the labour theory of value, machines serve as a repository for accumulated surplus-value that originates in labour, but are inert, hence their status as 'dead' labour. For the hedonistic conception of value of neoclassical theory, the machines are simply the means to satisfy the quantified desire of *homo oeconomicus*: individual utility-maximization.

As Trevor Pinch observes, "the Marxist analysis neglects the enabling aspects of materiality and technology" (2008, p. 463). The capacities of equipped labour cannot be reduced to either the labour or the equipment. Instead, they emerge from the hybrid. Latour and others have advocated for things as the 'missing masses' of the social sciences (Latour, 2008). Rather than intermediaries, things must be considered 'mediators,' which "transform, translate, distort, and modify the meaning or the elements they are supposed to carry" (Latour, 2005, p. 39). Mediators have affect. Things are essential for our complex social orders. Things make it possible to stabilize distant human relations, which cannot be achieved when bodies constitute our only materials (Strum & Latour, 1987). That stabilization is essential for the expansion that has been an important feature of human institutions. In one of the original works of actor-network-theory, John Law called attention to the role of things in long-distance navigation and Empire-making (Law, 1986). European navigational knowledge and colonial mindset meant nothing without objects to consolidate, standardize and spread that knowledge and actualize colonial practices. The possibilities of Empire only existed because of human-thing assemblages that can transcend the limits of pure human-human sociality. Law identified three classes of 'emissaries' necessary to the task of long-distance control: documents, devices and drilled people. They made it possible for those at the centre to monitor and regulate activities at the periphery. This role of things in stabilization makes apparent their indispensable role in accumulation.

Alex Preda links the accumulation of objects to power, arguing that "the larger the network with its objects, the stronger its force will be, and hence its authority, legitimacy, and power" (Preda, 1999, p. 358). However, the linear equation of power with size overlooks the fact that expansion can also weaken entities, as many mergers and failed product releases have demonstrated. Indeed, one could point to the Deepwater Horizon disaster as evidence of just such a weakness. Had BP been smaller, perhaps it would not have subcontracted the drilling operation. Perhaps this particular well would have been better known and understood by the executives at the head of the company. Perhaps those monitoring the operation would have been the owners whose financial stake was directly tied to the well. Instead, absentee owners were left to respond after the fact, translating the disaster as a revelation of weakness. That is precisely the CasP interpretation of BP losing half of its value in the wake of the disaster: the company was weaker than previously thought.

The relationship between adding things and gaining power is complicated, which is one of the reasons nominal financial values cannot be reduced to 'real' material quantities. Knowing that a corporation is adding things to itself is not enough to know its value will increase. Instead, additions are assessed within multiple affective contexts, such as current consumer trends, the pace of technological advance, and an innovation's degree of discontinuity. The corporations with the most employees and the most machines are not the most highly valued, i.e. the most powerful. Apple, for example, has demonstrated that a smaller customer base, but highly loyal to a restricted stable of products is of higher value than a more diffused product line. From the CasP conception, only expansion that translates into greater expected earnings or reduced risk, and thereby increases capitalized value, is interpreted as an increase in power.

Going Deeper Through the Blowout Preventer

The title of chapter two of the National Commission's Report to the President (2011) comes from a quote by an oil industry consultant uttered in 1970: "Each oil well has its own personality" (28). Knowledge of past wells can only partly inform engagement with present wells. Each well can be considered a subject, according to the simple definition offered by Peter Sloterdijk: unpredictability (2013). Oil bearing formations have to be studied to get a sense of what the well might be like. As the well is drilled, it is constantly monitored to understand its unique characteristics. The deeper the well is, the more unpredictable it will be. The task of drilling operations is to tame these unruly subjects.

One of the most important pieces of equipment for taming a well is the BoP. The BoP serves several functions of well control. However, the most vital function is to kill a well in the event of an emergency, such as an uncontrollable kick. The mechanism of last resort is the morbidly named deadman, which activates rams to seal off the well if the BoP loses contact with the surface. During the unfolding Deepwater Horizon disaster, the deadman mechanism failed to perform as expected. The reasons continue to be subject to dispute.

The blowout preventer was invented in 1922 and made commercially available in 1924. Before the use of the BoP, wells were allowed to blow out until the subsurface pressure was reduced enough to allow capping. This led to the iconic scene of thick, black oil gushing forcefully out the top of a drilling rig. The practice was dangerous, environmentally damaging and financially wasteful. The BoP made it possible to control the pressure differential and became a universal mechanism of oil exploration and extraction. Although the BoP continued to evolve, becoming capable of handling higher and higher well pressures, its vital role was

unchanged. As such, it became a stable — black boxed — part of the capitalization of firms involved in the oil industry.

Hughes (1993) identifies technological systems as a combination of technical, political and economic factors. It is the total combination that gets priced by capitalization. When something goes wrong and recalculations need to be made, the combination gets opened and parts identified for more precise recalculation. Those parts have to be situated within their technical trajectories, but also political and economic trajectories in order to perform such recalculations. Within the CasP framework, these examinations and resultant recalculations constitute a reassessment of power. The volatility of the price of BP during the disaster evidences the confusion about the make-up of the company's power. Some of the reassessment was an examination of the BoP.

Was the failure of the BoP on the Macondo well because of material shortcomings? If so, were these material shortcomings because it was poorly formulated by its producer or because it was mishandled by its user? Was such mishandling due to cost cutting measures by the well owner and/or drill operator, or was it due to the faulty practices of well workers? Might government regulations regarding BoP operation be revisited and changed in response? Might BoP installation and monitoring practices be changed? Might the structure of BoPs be changed? Each question opens up further questions, all of which have financial, and therefore accumulatory, consequences. As well, each question has material indeterminacy built in. How might the BoP respond to these changes? What will be required to 'tame' it and ensure the necessary compliance that will make its use predictable and therefore calculable? What will be the future political-economic-technological trajectory of BoPs? What will be the financial consequences? How will this impact the control of BP and other oil and oil services companies?

Early suspicions, confirmed by subsequent investigation, held that the problem of the Deepwater Horizon's BoP were unique rather than endemic. This suspicion, along with the expectation that the disaster would not result in widespread, costly changes in deep water oil exploration practices, is likely the reason the differential decline of other Gulf exploring oil companies was relatively short-lived. By the end of 2010, these companies would be beating the S&P 500.

As part of the Deepwater Horizon drilling assemblage, the operation of the BoP, or one channel of its operation, took for granted a worker-object who could trigger the various rams capable of closing off the well. On the one hand, should everything go as planned, then the worker's actions will be black boxed as unfolding in accordance with established and expected routines. On the other hand, in expectation that the workers' actions may be disrupted, there are redundancies built into the system that are supposed to automatically trigger the BoP. However, these systems assume some prior work by other worker-objects translated into material mechanisms, such as the dual battery systems that are supposed to drive the blind shear rams in the event that communication with the rig is lost. In the case of the Deepwater Horizon disaster, these batteries had not been properly installed or maintained.

There are multiple lines along which failures occur, including the regulatory line. There was no oversight to ensure that these batteries, and the systems they were to power, were functioning properly. Another line passes through the workers who were blamed for the error, but we could follow the line further and possibly find problems with their training or with training manuals. The investigation of the disaster constituted a long line of opening black boxes and the quantifications of some market participants would have followed along trying to translate the findings into capitalized values.

Knowledge, Power and Disobedience.

Objects can be considered more obedient when the relations they mediate become more stable. This can occur through greater knowledge that is distributed between the object and its operator (Hutchins, 1995). For example, knowledge of oil wells is used to identify a 'kick' — the unwanted intrusion of hydrocarbons into the wellbore. With the kick identified, an appropriate response can be formulated. Kicks are not uncommon events and the vast majority are quelled. Identifying the kick depends on reliable equipment that translates signals from the well and a skilled, knowledgeable operator who properly interprets the signals. The operator can then trigger responsive actions that are relayed by series of worker-objects to quell the kick. Past experiences become standardized knowledge that gets passed on through textbooks and manuals. A skilled operator is one who embodies the industry knowledge, one who utilizes the signals from monitoring equipment to recognize that a kick is occurring and enacts established protocols.

Preda draws on Latour's network conception of power (Latour, 1987) and connects it to Foucault's insights on the relationship between power and knowledge. As Foucault (1980) argued, power can be increased by augmenting and improving knowledge of the entities under one's control, including things. Preda argues that things are essential participants in the development of knowledge and the performance of control. He remarks that while explanations for the social order should include artefacts, they should also consider the "strategies and resources through which human actors manage to account for a social order in which they take themselves as different with respect to the artifacts to which they are related" (Preda, 1999, p.

361). In other words, not only are things an essential component of confidence in obedience, so too is their exclusion from our understanding of the social order.

Things play an important role in the transfer of power that is expressed in accumulation. An alternative to skilled, knowledgeable operators are mechanisms devised to internalize a task, incorporating the industry's knowledge and the operator's skill into an automated response. Skilled operators, when they perform according to expectations, are — from the perspective of a company's owners — intermediaries. Unfortunately for the owners, workers have a history and a habit of disobedience, becoming indeterminate, unpredictable mediators who defy the calculative expectations of market participants. Workers pose a constant threat of work withdrawal and more. While collective bargaining agreements and other negotiating mechanisms have made strikes more predictable and financially manageable, worker agency remains much more uncertain than that of things. Hence, the history of technological development in the 20th century marked by automation as skill internalization, substituting relatively obedient machines for relatively disobedient workers (Braverman, 1998; Noble, 1984).

The relative obedience of machines contributes to making them calculable. As Callon (1998) writes, "if calculations are to be performed and completed, the agents and goods involved in these calculations must be disentangled and framed" (p. 16). The operating parameters of machines are well-known. They breakdown at predictable intervals that typically occur as a function of the pace of operation. This means optimal levels of output can be calculated, making profit levels more certain. This can then be translated in the capitalization formula into a lower risk factor. Conversely, things can disobey in an unpredictable, contingent manner. When that occurs, an operator's agency is required; they must be mediators. In such an event, the worker must transcend their skills, combining knowledge and equipment in a new way to create an

emergent procedure. Things provide the means to predictable, stable functioning. But, humans are needed to restabilize a system that deviates in an unpredictable way. That said, restabilization will also require things whose unwavering stability cannot be matched by even the most heroic of humans.

It was the Macondo well's disobedience that triggered the enormous loss of BP's power. Human ingenuity enlisted things to perform in unprecedented ways to finally stop the leak. As seen in Figure 1, reports of the impending capping drove up the capitalization of BP. Market participants assessed greater power via the human-object assemblage responsible for stopping the leak. All the ingenuity in the world would have been useless without the things. The stabilization of the company's new relative valuation required numerous things whose behaviour was calculable for the fact of being stable and predictable. Those calculations will black box the vast majority of BP's operations, with both humans and things inside, operating together in ways that are irreducible, but measurable (Latour, 1993). Typically, those boxes will remain closed as predictable, obedient entities unless there is an event that defies the calculations, as occurred with the Deepwater Horizon disaster.

Conclusion.

The neglect of objects from our accounts of social asymmetries is itself a mechanism of power. The more we overlook the irreducible role of equipment in the emergence of tactics used to order society the easier it is to develop and deploy such mechanisms of control. The dominant theories of value leave no place for things as mediators. According to these theories, objects are either intermediaries for the satisfaction of desire or stores of dead labour. I argue that Nitzan and Bichler's power theory of value, which conceptualizes differential capitalization as an

expression of power, makes it possible to understand things as dynamic participants in the constant evolution of the qualities of capitalism. The construction of values is an on-going recalculative assessment that closes and opens black boxes, inside of which are assemblages of worker-objects quantified through a variety of measures, but passing into the quantities of finance, culminating in capitalization.

The Deepwater Horizon disaster unfolded as a complex, indeterminate event that market participants translated into uncertain valuations of BP and other capitalized entities. The capital value assigned to the company fluctuated wildly as it trended downward. The repricing occurred as black boxes were opened. First, market participants had to make qualitative sense of the contents, including such objects as BoPs, nitrogen-rich cement, float-shoes, blind-shear rams and hydrocarbons. Then, all this qualitative diversity had to be translated into the commensurable units of finance.

Financial markets have a single-minded purpose: evaluation. That evaluation is based on a remarkably simple criterion: discounted expected profits. However, the actual process of evaluation, one that tries to bring the future into the present, is incredibly complex. It draws information into and along what Latour & Lepinay (2010) call 'metrological chains.' Out the other end, via the process of buying and selling shares, a single number emerges. That number gets folded back into the calculations, which are without end. The incredible complexity makes it difficult to identify 1) what is being accounted for; 2) how anything is being evaluated; or, 3) when new entities and processes get counted. Much of what counts is black boxed because market participants are confident in the obedience of what is inside. However, moments of crisis, such as the Deepwater Horizon disaster, can offer a window into the struggle of evaluation, as

black boxes are thrown open and entities must be re-evaluated. The CasP method offers a means of identifying the market's efforts to make sense of the world remade by the crisis.

References.

Ayache, E. (2010). *The Blank Swan: The End of Probability*. West Sussex, UK: Wiley.

Braverman, H. (1998). *Labor and monopoly capital: The Degradation of work in the Twentieth Century*. New York: Monthly Review Press.

Callon, M. (1998). Introduction: The embeddedness of economic markets in economics. In M. Callon (Ed.), *The laws of the market* (pp. 1–57). Oxford, UK: Blackwell Publishers.

Cohen, A. J., & Harcourt, G. C. (2003). Retrospectives: Whatever happened to the Cambridge capital theory controversies? *The Journal of Economic Perspectives*, *17*(1), 199–214.

B. P. (2010). Deepwater Horizon accident investigation report. Retrieved from http://www.bp.com/content/dam/bp/pdf/sustainability/issue-reports/Deepwater_Horizon_Accident_Investigation_Report.pdf

Foucault, M. (1980). *Power/knowledge: Selected interviews and other writings, 1972-1977*. New York: Pantheon Books.

Hodgson, G. M. (1997). The Fate of the Cambridge capital controversy. In P. Arestis, G. Palma, & M. Sawyer (Eds.), *Capital controversy, post Keynesian economics and the history of economic thought* (pp. 88–101). London: Routledge.

Hughes, T. P. (1993). *Networks of power: Electrification in western society, 1880-1930*. Baltimore, MD: The Johns Hopkins University Press.

Hutchins, E. (1995). *Cognition in the wild*. Cambridge, MA: MIT Press.

Knorr-Cetina, K. D. (1981). *The manufacture of knowledge: An essay on the constructivist and contextual nature of science*. Oxford, UK: Pergamon Press.

Knorr Cetina, K., & Bruegger, U. (2000). The market as an object of attachment: Exploring postsocial relations in financial markets. *Canadian Journal of Sociology*, *25*(2), 141–168.

Latour, B. (1986). The powers of association. In J. Law (Ed.), *Power, action and belief: A new sociology of knowledge?* (pp. 264–280). London: Routledge & Kegan Paul.

Latour, B. (1987). *Science in action: How to follow engineers and scientists through society*. Cambridge, MA: Harvard University Press.

Latour, B. (1993). Irreductions. In *The pasteurization of France* (pp. 153–238). Cambridge, MA: Harvard University Press.

Latour, B. (2005). *Reassembling the social: An introduction to actor-network-theory*. Oxford, UK: Oxford University Press.

Latour, B. (2008). Where are the missing masses? The sociology of a few mundane artifacts. In D. J. Johnson & J. M. Wetmore (Eds.), *Technology and society, building our sociotechnical future* (pp. 151–180). Cambridge, MA: MIT Press.

Latour, B., & Lepinay, V. A. (2010). *The science of passionate interests: An introduction to Gabriel Tarde's economic anthropology*. Chicago: Prickly Paradigm Press.

Latour, B., & Weibel, P. (2005). *Making things public*. Cambridge, MA: The MIT Press.

Latour, B., & Woolgar, S. (1985). *Laboratory life: The construction of scientific facts*. Princeton, NJ: Princeton University Press.

Law, J. (1986). On the methods of long distance control: Vessels, navigation, and the Portuguese route to India. In J. Law (Ed.), *Power, Action and Belief: A New Sociology of Knowledge?* (pp. 234–263). London: Routledge & Kegan Paul.

MacKenzie, D. (1998). *Knowing machines: Essays on technical change*. Cambridge, MA: MIT Press.

MacKenzie, D. (2008). *Material markets: How economic agents are constructed*. Oxford, UK: Oxford University Press.

Miller, D. (1997). *Material Culture and Mass Consumption*. Hoboken, NJ: Wiley-Blackwell.

Muniesa, F. (2008). Trading-room telephones and the identification of counterparts. In R. Swedberg & T. Pinch (Eds.), *Living in a material world: Economic sociology meets science and technology studies* (pp. 291–313). Cambridge, MA: MIT Press.

National Commission on the BP Deepwater Horizon Oil Spill. (2011). *Deep Water: The Gulf Oil Disaster and the Future of Offshore Drilling: Report to the President*, January 2011. Retrieved from https://www.gpo.gov/fdsys/pkg/GPO-OILCOMMISSION/content-detail.html

Nitzan, J., & Bichler, S. (2009). *Capital as power: A study of order and creorder*. London: Routledge.

Noble, D. F. (1984). *Forces of Production: A Social History of Industrial Automation*. New York: Alfred A. Knopf.

Pinch, T. (2008). Technology and institutions: Living in a material world. *Theory and Society*, *37*(5), 461–483.

Preda, A. (1999). The turn to things: Arguments for a sociological theory of things. *The Sociological Quarterly*, *40*(2), 347–366.

Preda, A. (2008). Technology, agency and financial price data. In R. Swedberg & T. Pinch (Eds.), *Living in a material world: Economic sociology meets science and technology studies* (pp. 217–252). Cambridge, MA: MIT Press.

Shaikh, A. M., & Tonak, E. A. (1994). *Measuring the wealth of nations: The political economy of national accounts*. Cambridge, UK: Cambridge University Press.

Slater, D., & Barry, A. (2005). *The technological economy*. London: Routledge.

Sloterdijk, P. (2013). *In the world interior of capital: Towards a philosophical theory of*

globalization. (W. Hoban, Trans.). Cambridge, UK: Polity Press.

Stiglitz, J. E., & Sen, A. (2009). *Report by the Commission on the Measurement of Economic Performance and Social Progress* (pp. 1–292). Commission on the Measurement of Economic Performance and Social Progress. Retrieved from http://www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf

Strum, S. S., & Latour, B. (1987). Redefining the social link: from baboons to humans. *Social Science Information*, *26*(4), 783–802.

Swedberg, R., & Pinch, T. (Eds.). (2008). *Living in a material world: Economic sociology meets science and technology studies*. Cambridge, MA: MIT Press.

Veblen, T. (1921). *The engineers and the price system*. Kitchener, ON: Batoche Books.