SHAREHOLDERS' VOTING POWER AND BLOCK TRANSACTION PREMIA: AN EMPIRICAL ANALYSIS OF ITALIAN LISTED COMPANIES

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ABSTRACT

According to our pricing framework block transaction premia depend on voting power being transferred through a block relative to voting power enjoyed by the market. Block transaction premia are shown to be correlated with both the block seller's and the block buyer's Shapley-Shubik power indexes in a sample of Italian companies. This is consistent with the notion, first presented by Zwiebel (1995), that private benefits deriving from control of a company are divisible, and that the share of private benefits accruing to each shareholder is proportional to the probability of being pivotal in a controlling coalition.

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1. Introduction

Shares of listed companies are usually traded in regulated, multilateral stock markets. However large blocks of shares often trade outside the stock market in bilateral negotiations. The price of a common share belonging to a block usually differs from the market price of a share. It has already been recognised that block transactions are often control transactions (Barclay and Holderness, 1991). Moreover, it is known that control could be sold at a price which differs from the market price of shares (Bebchuk, 1994) because controlling shareholders receive private benefits from control - i.e. non verifiable consumption and investment opportunities which are associated with discretion in allocating company resources. Yet we are not aware of pricing models for block transactions. This paper takes a preliminary step in this direction by highlighting the link between block premia and shareholders' voting power.

In our pricing framework, we exploit the fact that the value of a block is bounded below by the seller's valuation and above by the buyer's valuation. The seller (buyer)'s valuation is linked to the share of private benefits lost (acquired) with the block, which is in turn related to forgone (acquired) strategic importance. Similarly, the exchange price should be linked to the share of private benefits accruing to shareholders who trade in the marketplace, which is related to their strategic relevance. In pricing blocks we are therefore adapting Zwiebel's (1995) idea that private benefits from control are divisible and that the share accruing to a block investor depends on the strategic importance of the investor's block in forming controlling coalitions.

In order to assess the empirical relevance of this hypothesis, we compute voting power indexes for the block seller, the block buyer and for the market both before and after the transaction. Block premia are then related to voting power indexes in a cross section of listed Italian companies. Italy is an interesting case study since control blocks of listed companies often trade outside the stock market. Public companies, which are common in Anglo-Saxon countries and allow several control transactions to take place in the stock market through take-overs, are quite rare in Italy. On the contrary, family groups hold controlling interests through a pyramidal hierarchy of financial and operational companies.

In this paper we do not estimate a structural model. The aim of our empirical part is instead to offer some stylised facts about the potential of Shapley values in pricing blocks, which - to our knowledge - has never been done so far[1]. Shapley values were previously used by Andretta et al. (1990), Buzzacchi and Mosconi (1993), Rydquist (1987) and Zingales (1994, 1995) in order to price shares which are traded in the market.

Section 2 lays out a simple pricing model. In order to focus on ownership structure we deliberately ignore the impact of capital structure (Harris and Raviv, 1988), of market liquidity (Campbell, Grossman and Wang, 1993), of blockholders' skills (Barclay and Holderness, 1991) and of transaction type (Bebchuk, 1994) on block premia. Section 3 contains our empirical analysis. The first two subsections present our data and some descriptive statistics concerning block premia, block size and shareholders' power indexes before and after the transaction. Section 3.3 reports on correlation between block premia and shareholders' voting power. Section 4 concludes.

2. Block Premium and Partial Benefits from Control

Zwiebel (1995) suggests that private benefits are divisible and that the share of private benefits accruing to a block investor depends on the strategic importance of the investor's block in forming controlling coalitions. According to this view, a moderate-sized block in a firm owned by many disperse individuals confers large private benefits. On the contrary, a moderate-sized block investor receives no private benefits if one investor enjoys a majority position. Private benefits accruing to blockholder i are set equal to the share φ_i of total private benefits C, where φ_i is the Shapley value of agent i in a majority weighted game[2].

In this paper we use the notion of partial private benefits in order to price voting shares in a stock market composed of both a bilateral block market and a multilateral market. The seller's valuation of his block V_s depends not only on forgone private

[1] We refer the reader to Nicodano and Sembenelli (1996), where private benefits are related to firm financial structure.

[2] We refer the reader to Shapley and Shubik (1954) for its definition and to Gambarelli (1983) for some of its properties. We also refer to Gul (1989) and Owen (1982) for details on the game theoretic foundations of Shapley values.

benefits $\varphi_s C$ but on forgone pecuniary benefits as well. Let q be the discounted cash flows generated by the company, N^T be the number of shares in the block, N_s be the number of shares held after the transaction and N be the total number of shares in the company. Before selling his block, his pecuniary benefits equal $\frac{q}{N}\left(N_S + N^T\right)$ and the seller's valuation of his shares is:

(1) $$V_S \equiv \varphi_S C + \frac{q}{N}\left(N_S + N^T\right)$$

After the transaction, his valuation amounts to:

(2) $$V'_S \equiv \varphi'_S C + \frac{q}{N} N_S$$

where we assume that φ'_S measures his new voting power and that both total private benefits and the expected stream of future profits are unaffected by the transaction. The seller's valuation of his block equals the difference between (1) and (2). The sum PN^T received from the block sale cannot be lower than his valuation:

(3) $$PN^T \geq (\varphi_S - \varphi'_S)C + \frac{q}{N} N^T.$$

By following a similar reasoning for the buyer we deduce the buyer's valuation of the block, which cannot be smaller than the amount paid for the block:

(4) $$PN^T \leq (\varphi'_b - \varphi_b)C + \frac{q}{N} N^T,$$

where φ_b (φ'_b) is the buyer's power index before (after) the transaction. The price of one share belonging to the block is therefore bounded below by the seller's valuation and above by the buyer's valuation:

$$\text{(5)} \qquad \frac{\varphi_S - \varphi'_S}{N^T} C + \frac{q}{N} \le P \le \frac{\varphi'_b - \varphi_b}{N^T} C + \frac{q}{N}.$$

The market price of common shares, conditional on a block transaction, should similarly depend on the valuation of shares by those investors who trade in the market. It should therefore be equal to the present value of not only pecuniary benefits but private benefits as well. Indeed, it has already been suggested that private benefits are reflected in the exchange price of a common share in proportion to outsiders' Shapley value (Zingales, 1995). Let P^e be the market price of a common share, ϕ (ϕ') be outsiders' Shapley value before (after) the transaction and N_o the number of outsiders' shares N_o. Then the market price of a common share before the transaction is:

$$\text{(6)} \qquad P^e = \frac{\phi C}{N_o} + \frac{q}{N} \qquad\qquad 0 \le \phi \le 1$$

and the pre-transaction block premium equals:

$$\text{(7)} \qquad \left(\frac{\varphi_S - \varphi'_S}{N^T} - \frac{\phi}{N_o}\right) C \le P - P^e \le P\left(\frac{\varphi'_b - \varphi_b}{N^T} - \frac{\phi}{N_o}\right) C.$$

A similar specification for the post-transaction premium obtains, with ϕ' ($p^{e\prime}$) replacing ϕ (p^e). (6) implies that stock market price behaviour around block transactions should be associated with changes in the Shapley value of stockholders trading in the market, if ϕ' differs from ϕ. (7), in turn, states that block transaction premium is determined by the share of total private benefits being transferred through the block relative to the share of private benefits enjoyed by the market. In the empirical section we present univariate correlations between the percentage premium on the one side and $\varphi_S - \varphi'_S$, $\varphi'_b - \varphi_b$ and ϕ on the other, after a brief description of our dataset.

3. Empirical Analysis

3.1 Data

Our sample consists of block transactions of listed companies which took place in Italy between 1987 and 1992. Most block prices, the name of the company, the number of shares in the block, the name of block traders come from Nomisma "Data on Mergers and Acquisitions".

The announcement date of the block transaction to the public and the missing data on block prices were retrieved through the business newspaper "Il Sole-24 Ore". Daily exchange prices were provided by Maurizio Murgia (Pavia University) for the time span which ranges from 120 days before to 120 days after the announcement. The distribution of shareholdings before and after the transaction is obtained primarily through "Taccuino dell'Azionista" directory, and complemented with "R&S" directory and the "Experimental Crossholdings Archive" edited by the Bank of Italy and CONSOB (the Italian SEC). In measuring voting shares we consolidated shareholdings which were controlled - through pyramidal groups - by the same shareholder. After merging these different datasets our original list of 545 transactions is reduced to 121 observations.

In order to identify outsiders' share of common stock, we adopted the following procedure. After the top shareholders - together with the size of their holdings - had been identified, we set the market share equal to the difference between the total number of voting shares and the sum of top shareholders' holdings of voting shares. The Shapley-Shubik indexes for buyers, sellers and for the market were calculated using Gambarelli (1996) algorithm.

Italian Law requires a 50% majority for most corporate decisions, and 66% for others. It also offers special rights to certain minority stakes (10%, 20%...), which may then have bargaining power vis à vis the controlling shareholders. Therefore, we used different majority percentages such as (50%, 66%, 80%, 90%) in computing Shapley values. Empirical regularities - which are reported below for the 50% majority rule - carry over to different majority rules with reduced statistical significance.

3.2 Descriptive Statistics

Table 1 portrays the distribution of the size of blocks, defined as N^T/N, in our sample. It can be seen that more than 50% of our transactions concern small-sized blocks. Although a small-sized block transaction could in principle transfer large control benefits, we expected voting power transferred by small blocks to be small on average. Given the sample distribution of N^T/N and the fact that 10% is the smallest share of votes conferring special rights in Italy, we partitioned our sample at a block size of 10%. In the subsample of blocks containing at least 10% of common shares (second column, Table 1) the incidence of majority transaction exceeds 25%.

In our simple framework of section 2 we overlooked the effect of stock market liquidity on stock market price and the premium. Yet liquidity effects are known to be relevant. We computed percentage block premia in Tables 2, 3 and 4 using averages of stock market prices, in order to wash away the effect of idiosyncratic liquidity shocks on market price. $p^e_{-1,-t}$ is the arithmetic average of stock market price from day -t to the day before the announcement, whereas $p^e_{1,t}$ is the average of market prices from day 1 to day t after the announcement.

Comparing across Tables 2 and 3 shows a median premium equal to 8.9% on the announcement day for the entire sample, which grows to 12.2% when only larger blocks are considered - consistent with the presumption that larger blocks transfer a larger share of private benefits. Both in the full sample and in the two subsamples the sample mean (26.2% for the full sample; 32.6% for larger blocks, 20% for smaller blocks) is greater than the median because the distribution is skewed due to a sizeable number of large premia. Also negative premia are present in the first quartile, and are larger - in absolute value - for the subsample containing smaller blocks (Table 4).

These negative premia cannot be ascribed - following equation (7) - to the fact that such blocks transferred less voting power than the voting power enjoyed by the market, as it is always possible for a seller to sell his (split-up) block in the market. One possible explanation for negative premia which is consistent with equation (7) is negative private benefits arising from financial distress: the value of private benefits may turn negative ($C<0$) in insolvency because controlling shareholders loose reputation to stakeholders, and may be prosecuted by creditors. Another explanation for negative premia is associated with compensation for liquidity provision being asked by the block buyer. When there is a positive supply (demand) shock, traders buy (sell) at a discount (premium) for increased exposure to risk and adverse selection. This liquidity effect increases in the size of supply (demand) shock, for given risk aversion, profit variability and - in an anonymous market - incidence of insider trading (Grossman and Stiglitz, 1980). If a block, carrying negligible voting power, is offered for sale the price reduction requested by the buyer in order to take on more risk may dominate the voting premium, thus leading to negative premia.

Barclay and Holderness (1989) also encounter negative premia on the announcement day, which account for 20% of their sample. Their median premium (15.7%) is higher than ours. This divergence cannot be ascribed to their sample selection, comprising blocks of at least 5% of a firm's outstanding common stock, since our median premium is lower also for the subsample comprising blocks larger than 10% as well. On the contrary, their mean premium (20.4%) is lower than the one we find both in the full sample and for larger blocks. The fact that the distribution is more skewed in our sample is not surprising since ownership structures are less concentrated in the U.S. than in Italy. This in turn implies that a moderate sized block is more likely to be pivotal and consequently to command a premium in the U.S., whereas in Italy only relatively rare majority block transfers are associated with large transfers of private benefits.

A clear-cut feature of the distribution of block premia across time is its inverted bell shape. The (median) exchange price grows from day (-120) to the announcement day, then falls to a level which can be lower than the beginning one. This points to a positive temporary effect of block transactions on the exchange price. In our simple framework (7) this could be due to a temporary change in the market Shapley value ϕ.

Alternatively, excess demand for shares in the market before (the announcement of) large block transactions - which would cause market prices to increase - may be motivated by insider trading. Insider purchases should however be associated to value increasing transactions, exerting a permanent change in the market price of shares which cannot be found in our data. Insider trading cannot therefore account for the inverted-bell shape of the premium around the block transaction.

When investors are heterogeneous only in their private investment opportunities and not in their information sets, stock prices may change following either new public information about future dividends, or changes in an investor's private investment opportunities. In the latter case, price grows (falls) to reflect the investor's need to buy (sell) and to attract trading counterparts. Since price changes without any expected change in future dividends, a return reversal is expected (Campbell et al., 1993). This explanation would fit our data, provided we could explain why private investment opportunities induce investors to buy in the market - rather than sell - before (the announcement of) block transactions. Purchases in advance of block transactions by block traders might be motivated by arbitrage when the market price of shares is lower than the block price. Yet the inverted bell shape is present also when blocks trade at a discount relative to market price.

The distribution of Shapley values across shareholder's types and time is portrayed in Tables 5 (full sample), 6 (size of blocks ≥ 0.10) and 7 (size of blocks <0.10). The sum of seller's, buyer's and market power indexes before (after) the transaction is lower than 1, on average, because there are other large shareholders who are not involved in the bilateral transaction, and do not belong to the market by construction. Sellers before the transaction have on average greater voting power (mean for full sample is .493) than buyers both before (.036) and after (.283) the transaction. Buyers after the purchase have in turn greater voting power than the market (.149 before and .134 after the transaction) - apart from the case of smaller blocks.

Table 5 reveals that the share of sellers' who are in control of the company is smaller than 50% but larger than 25%. This is true also when we restrict attention to smaller blocks[3]. Consistent with our expectation that larger blocks transfer larger voting power, the voting power differentials $\varphi_S - \varphi'_S$ and $\varphi'_b - \varphi_b$ grow when attention is restricted to larger blocks (Table 6). Table 6 confirms that more than 25% of larger block transactions are control transfers, and also shows that 25% of larger block

[3] Approximately 54% (58%) of our sample is composed of companies which were controlled through the absolute majority of votes before (after) the transaction.

transactions do not transfer any voting power. For larger blocks, the seller's voting power index before the transaction is always close to the buyer's power index after the transaction. On the contrary, smaller blocks flow from relatively powerful sellers to buyers who are relatively powerless both before and after the purchase.

3.3 Correlation Analysis

Table 8 portrays the correlation between the premium at various dates and the size of the block. When attention is focused on the full sample (first column) or on larger blocks (middle column) the correlation is positive and statistically significant. For smaller blocks, it turns insignificant. This is consistent with the idea that block premia have two component, one (non-negative) related to voting power being transferred, the other one (non-positive) related to compensation for liquidity provision by the block buyer. In larger blocks the first component, which grows with the size of the block[4], dominates. In smaller blocks the second component, which also increases in absolute value in the size of the block but is negative, offsets the positive impact of the voting power component.

We now come to the predictions of our pricing framework (7):

(i) a positive relation between φ_S - φ'_S and/or φ'_b - φ_b on the one side and the block premium on the other;

(ii) a negative relation between ϕ (ϕ') and pre-transaction (post-transaction) premium.

Furthermore, even if it does not derive directly from our pricing model, it is reasonable to assume that:

(iii) (i) and (ii) are more likely to hold when larger block are traded.

Tables 9 (full sample) and 10 (subsample for larger blocks) show simple correlations between percentage block premia at various dates, and shareholders' Shapley values. Both φ_S - φ'_S and φ'_b - φ_b are positively correlated with the premium,

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4 In Burkart et al. (1996) block premium associated to control rents is decreasing in the size of the block. However, this behaviour applies to premia on controlling blocks which represent less than 50% of voting equity. These represent too small a share of our sample to be relevant in our correlation analysis.

and statistically significant. ϕ and ϕ' have the expected negative sign[5], but are not statistically significant - possibly because of moderate cross sectional variation. When attention is restricted to smaller blocks (Table 11), voting power indexes loose explanatory power. This seems consistent with smaller blocks premia being affected, with equal strength, by the voting and the liquidity component. In this subsample we also detect an asymmetry between the buyer and the seller, which we are not able to rationalise. Indeed, while the sign of the seller's voting power is positive and marginally significant the buyer's is negative, even if not significant.

4. Concluding Comments

Seller's and buyer's power index differentials are correlated with block premia in a sample of block transactions. Correlation coefficients are large, statistically significant, with the expected sign and stable over time for large block transactions, which are associated with the transfer of considerable voting power.

Block premia for smaller blocks, which in our sample transfer little voting power, are uncorrelated with Shapley values. Premia on smaller blocks are probably affected by market liquidity rather than private benefits, as suggested by the smaller correlation coefficients between block premia and block size.

Results concerning larger blocks are consistent with the view that private benefits deriving from control of a company are divisible, and that the share of private benefits accruing to each shareholder is proportional to the probability of being pivotal in a controlling coalition. It also confirms that voting power differentials can provide help in pricing blocks. Further progress in this area requires abandoning the assumption that private benefits are unrelated to capital structure - a step which is in our research agenda.

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[5] Outsiders' power index is likely to have been overestimated due to our assumption of co-ordinated behaviour. Yet the sign of our correlation coefficient do not seem to suffer - possibility because the cross sectional distribution of ϕ is not significantly altered by this measurement problem.

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Table 1 - Descriptive Statistics for Size of Traded Blocks

	Full Sample	Only Blocks ≥ 0.1	Only Blocks < 0.1
Mean	0.188	0.344	0.039
Std. Dev.	0.216	0.218	0.021
1 quartile	0.030	0.129	0.023
Median	0.090	0.299	0.031
3 quartile	0.263	0.522	0.053

Table 2 - Descriptive Statistics for Alternative Definitions of Premium
Full Sample (121 Cases)

	$\frac{p-p^e_{-1,-120}}{p^e_{-1,-120}}$	$\frac{p-p^e_{-1,-30}}{p^e_{-1,-30}}$	$\frac{p-p^e_{-1,-7}}{p^e_{-1,-7}}$	$\frac{p-p^e_{0}}{p^e_{0}}$	$\frac{p-p^e_{1,7}}{p^e_{1,7}}$	$\frac{p-p^e_{1,30}}{p^e_{1,30}}$	$\frac{p-p^e_{1,120}}{p^e_{1,120}}$
Mean	0.323	0.287	0.279	0.262	0.263	0.283	0.339
1 quartile	-0.018	-0.026	-0.027	-0.037	-0.028	-0.020	-0.008
Median	0.142	0.115	0.091	0.089	0.106	0.106	0.171
3 quartile	0.442	0.426	0.373	0.337	0.368	0.369	0.411

Table 3 - Descriptive Statistics for Alternative Definitions of Premium
Only blocks ≥ 0.10 (59 Cases)

	$\frac{p-p^e_{-1,-120}}{p^e_{-1,-120}}$	$\frac{p-p^e_{-1,-30}}{p^e_{-1,-30}}$	$\frac{p-p^e_{-1,-7}}{p^e_{-1,-7}}$	$\frac{p-p^e_{0}}{p^e_{0}}$	$\frac{p-p^e_{1,7}}{p^e_{1,7}}$	$\frac{p-p^e_{1,30}}{p^e_{1,30}}$	$\frac{p-p^e_{1,120}}{p^e_{1,120}}$
Mean	0.437	0.361	0.337	0.326	0.319	0.351	0.408
1 quartile	0.007	-0.009	-0.014	-0.019	-0.032	-0.020	0.013
Median	0.195	0.174	0.143	0.122	0.133	0.147	0.234
3 quartile	0.602	0.545	0.537	0.529	0.541	0.539	0.520

Table 4 - Descriptive Statistics for Alternative Definitions of Premium
Only Blocks < 0.10 (62 cases)

	$\frac{p-p^e_{-1,-120}}{p^e_{-1,-120}}$	$\frac{p-p^e_{-1,-30}}{p^e_{-1,-30}}$	$\frac{p-p^e_{-1,-7}}{p^e_{-1,-7}}$	$\frac{p-p^e_{0}}{p^e_{0}}$	$\frac{p-p^e_{1,7}}{p^e_{1,7}}$	$\frac{p-p^e_{1,30}}{p^e_{1,30}}$	$\frac{p-p^e_{1,120}}{p^e_{1,120}}$
Mean	0.215	0.217	0.223	0.200	0.209	0.218	0.274
1 quartile	-0.054	-0.062	-0.037	-0.052	-0.045	-0.027	-0.045
Median	0.035	0.058	0.061	0.059	0.062	0.067	0.128
3 quartile	0.267	0.174	0.174	0.166	0.162	0.175	0.321

Table 5 - Descriptive Statistics for Shapley Values

Full Sample (121 Cases)

	φ_s	φ'_s	φ_b	φ'_b	Φ	Φ'
Mean	0.493	0.262	0.036	0.282	0.149	0.133
1 quartile	0.000	0.000	0.000	0.000	0.000	0.000
Median	0.333	0.000	0.000	0.000	0.000	0.000
3 quartile	1.000	0.448	0.000	0.517	0.097	0.107

Table 6 - Descriptive Statistics for Shapley Values

Only blocks ≥ 0.10 (59 Cases)

	φ_s	φ'_s	φ_b	φ'_b	Φ	Φ'
Mean	0.538	0.099	0.052	0.528	0.130	0.085
1 quartile	0.000	0.000	0.000	0.000	0.000	0.000
Median	0.667	0.000	0.000	0.533	0.000	0.000
3 quartile	1.000	0.000	0.000	1.000	0.024	0.000

Table 7 - Descriptive Statistics for Shapley Values

Only Blocks < 0.10 (62 cases)

	φ_s	φ'_s	φ_b	φ'_b	Φ	Φ'
Mean	0.451	0.417	0.021	0.050	0.168	0.178
1 quartile	0.000	0.000	0.000	0.000	0.000	0.000
Median	0.094	0.000	0.000	0.000	0.000	0.000
3 quartile	1.000	1.000	0.000	0.033	0.150	0.169

Table 8 - Simple Correlations between Premium and Size of Traded Blocks

	Full Sample	Block $\geq$ 0.10	Block $<$ 0.10
$\frac{p-p^e_{-1,-120}}{p^e_{-1,-120}}$	***0.348	***0.413	0.128
$\frac{p-p^e_{-1,-30}}{p^e_{-1,-30}}$	***0.297	***0.423	0.091
$\frac{p-p^e_{-1,-7}}{p^e_{-1,-7}}$	***0.258	***0.392	0.064
$\frac{p-p^e_{0}}{p^e_{0}}$	***0.265	***0.376	0.067
$\frac{p-p^e_{1,30}}{p^e_{1,7}}$	***0.238	***0.345	0.066
$\frac{p-p^e_{1,30}}{p^e_{1,7}}$	***0.245	***0.332	0.068
$\frac{p-p^e_{1,120}}{p^e_{1,120}}$	**0.217	***0.294	0.042

Significance Level: *** = 0.01; ** = 0.05; * = 0.10

Table 9 - Simple Correlations between Premium and Shapley Values

Full Sample (121 Cases)

	$\frac{p-p^e_{-1,-120}}{p^e_{-1,-120}}$	$\frac{p-p^e_{-1,-30}}{p^e_{-1,-30}}$	$\frac{p-p^e_{-1,-7}}{p^e_{-1,-7}}$	$\frac{p-p^e_{0}}{p^e_{0}}$	$\frac{p-p^e_{1,7}}{p^e_{1,7}}$	$\frac{p-p^e_{1,30}}{p^e_{1,30}}$	$\frac{p-p^e_{1,120}}{p^e_{1,120}}$
$\varphi_s - \varphi'_s$	***0.382	***0.294	***0.258	***0.255	***0.285	***0.303	***0.293
$\varphi'_b - \varphi_b$	***0.383	***0.316	***0.279	***0.282	***0.264	***0.270	***0.239
Φ	-0.037	-0.017	-0.020	-0.016	-0.057	-0.070	-0.064
Φ'	-0.039	-0.049	-0.059	-0.059	-0.042	-0.037	0.010

Table 10 - Simple Correlations between Premium and Shapley Values

Only blocks ≥ 0.10 (59 Cases)

	$\frac{p-p^e_{-1,-120}}{p^e_{-1,-120}}$	$\frac{p-p^e_{-1,-30}}{p^e_{-1,-30}}$	$\frac{p-p^e_{-1,-7}}{p^e_{-1,-7}}$	$\frac{p-p^e_{0}}{p^e_{0}}$	$\frac{p-p^e_{1,7}}{p^e_{1,7}}$	$\frac{p-p^e_{1,30}}{p^e_{1,30}}$	$\frac{p-p^e_{1,120}}{p^e_{1,120}}$
$\varphi_s - \varphi'_s$	***0.422	***0.366	***0.342	***0.307	***0.376	***0.379	***0.353
$\varphi'_b - \varphi_b$	***0.475	***0.465	***0.439	***0.408	***0.399	***0.392	***0.351
Φ	-0.083	-0.027	-0.017	-0.008	-0.103	-0.119	-0.144
Φ'	-0.159	-0.154	-0.152	-0.147	-0.128	-0.129	-0.111

Table 11 - Simple Correlations between Premium and Shapley Values

Only Blocks < 0.10 (62 cases)

	$\frac{p-p^e_{-1,-120}}{p^e_{-1,-120}}$	$\frac{p-p^e_{-1,-30}}{p^e_{-1,-30}}$	$\frac{p-p^e_{-1,-7}}{p^e_{-1,-7}}$	$\frac{p-p^e_{0}}{p^e_{0}}$	$\frac{p-p^e_{1,7}}{p^e_{1,7}}$	$\frac{p-p^e_{1,30}}{p^e_{1,30}}$	$\frac{p-p^e_{1,120}}{p^e_{1,120}}$
$\varphi_s - \varphi'_s$	*0.204	0.144	0.117	0.141	0.157	*0.185	**0.262
$\varphi'_b - \varphi_b$	-0.049	-0.093	-0.103	-0.072	-0.078	-0.098	-0.123
Φ	0.037	0.007	-0.011	-0.010	-0.007	-0.012	0.022
Φ'	0.113	0.054	0.024	0.029	0.040	0.057	0.124

Significance Level: *** = 0.01; ** = 0.05; * = 0.10

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