Stock Market Gap:
Equity Liquidity and Characteristics of US Firms

Ser-Huang Poon (Manchester Business School)

Kostas Stathopoulos (MBS) & Michael Rockinger (SFI)

October 12, 2009

Pilot Studies

Several MSc students working on various parts of the project for their MSc dissertations:

- Dongxu Zhang (MBS)
- Jian-Rui Wang (MBS)
- Roger T. (Lausanne)

Motivation

- The impact of subprime crisis on liquidity (funding, trading)
- The following relationships are well known but never tested for stressed periods:
  - Liquidity vs. Asset Pricing
  - Liquidity vs. Firms' Characteristics
  - Liquidity vs. Ownership Structure
  - Liquidity vs. Corporate Governance

Liquidity Measures Defined

From Basel documents and previous literature

1. Spread or transaction cost - sell-side spread, buy-side spread and round trip spread
2. Time and ease of execution - zero return count (zero volume day, no trade), market depth
3. Autocorrelation of returns - least likely if market is efficient and functioning normally
4. Price impact - trading itself caused price to change, e.g. stressed sales (difficult to separate out the market effect and the trading effect)

Literature on Liquidity

1. Information asymmetry and adverse selection
2. Inventory
3. Competition (especially among informed investors/traders)
4. Funding liquidity vs. trading liquidity (Crisis periods; liquidity dried up caused gaps or gaps caused illiquidity?)

Literature on Liquidity: New Development

- Since liquidity cost is a choice between e.g. spread, execution time and price impact, the final outcome must be a complex optimisation based on utility, investment style and legal constraint (e.g. margin vs. capital requirement).
- If everything is uncertain e.g. even bid-ask spread and trading volume themselves are uncertained (hence there is a need to monitor their volatility), there is an additional level of complexity in terms of impact and pricing.
- That is not only that there is a liquidity premium (compensate for less liquid stocks), there should also be a premium for liquidity risk i.e. changing liquidity.

Liquidity: Conventional Notion

Liquidity is a good thing

- Illiquidity stock must compensate investor for more return, hence low price
- Stocks of firms with good governance should be more liquid because of shareholder protection and information flow

Is equity liquidity always a good thing?

- Liquidity associates with greater volatility (which is the cause?)

Is there a single measure of liquidity?

- If the spread is small and the price impact is large, the stock is liquid or illiquid?

Capital for incremental risk in the trading book
(Basel July 2009)

- The IRC model should capture the impact of rebalancing positions at the end of their liquidity horizons so as to achieve a constant level of risk over a one-year capital horizon.
- The liquidity horizon represents the time required to sell the position or to hedge all material risks covered by the IRC model in a stressed market.
- The liquidity horizon must be measured under conservative assumptions and should be sufficiently long that the act of selling or hedging, in itself, does not materially affect market prices.

Revisions to the Basel II market risk framework
(July 2009)

- Banks must consider all relevant factors when determining the appropriateness of valuation adjustments/reserves the adjustment for less liquid positions.
- These factors may include, but are not limited to
  - the amount of time it would take to hedge out the position/risks within the position,
  - the average volatility of bid/offer spreads
  - the availability of independent market quotes (number and identity of market makers),
  - the average and volatility of trading volumes (including trading volumes during periods of market stress).

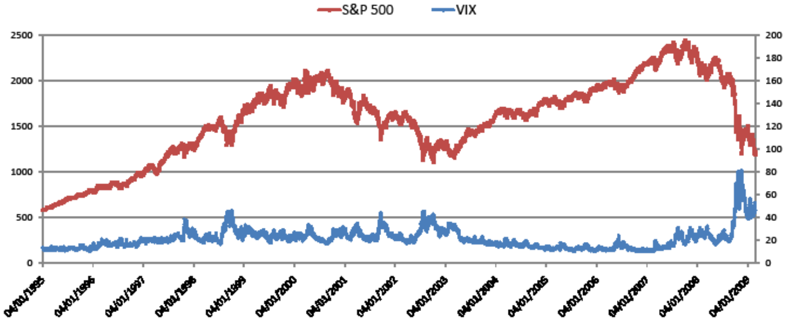
Stressed VaR

- Implementation date: 31 December 2010
- Capital required,

$$\begin{aligned} c &= \max\{VaR_{t-1}; m_c \cdot VaR_{avg}\} \\ &\quad + \max\{sVaR_{t-1}; m_s \cdot sVaR_{avg}\} \\ &\quad + \text{"plus"} \\ \text{"plus"} &= \delta \times \text{backtesting outcome of } VaR \end{aligned}$$

  for $m_c \geq 3$, $m_s \geq 3$ and $0 \leq \delta \leq 1$.
- Stressed VaR ($sVaR$): One year observation period relating to significant losses
- VaR ($sVaR$): Most recent one-year observation period
- How many peak losses can the bank sustain

Measuring stock market gap




Positive GAP
S_T
time T
$S_T(1-g)$
Gap size
T-h
S_t
Time

The Gap Measure

If $\Phi_q^{-1}(\mu_t, \sigma_t)$ represent the q-th percentile of the normal distribution, $N(\mu_t, \sigma_t)$, then we set

$$g^- = \Phi_{q^-}^{-1}(\mu_t, \sigma_t) \quad \text{with } q^- = 1\%$$

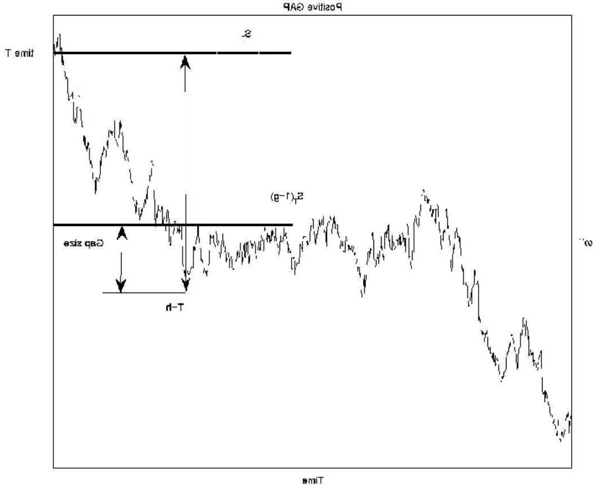
where μ_t and σ_t are the mean and standard deviation of the H-period returns over the previous 10 years, or whenever the company record started if the company has a less than 10 years history at time t.

Definition

A negative gap takes place when the maximum percentage loss over the previous H period exceeds the threshold

$$\max_{i=1,\cdots,H}\left\{\frac{S_{t-i} - S_t}{S_t}\right\} \geq \left|g_t^-\right| \qquad \text{for } S_{t-i} > S_t$$

where S_t is the price level at time t.


Positive GAP
time T
S_T
S_T(1−g)
Gap size
T−h
Time

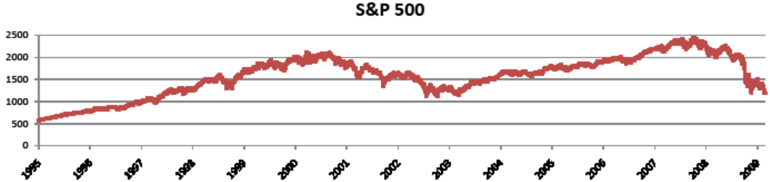
Sample of US Firms

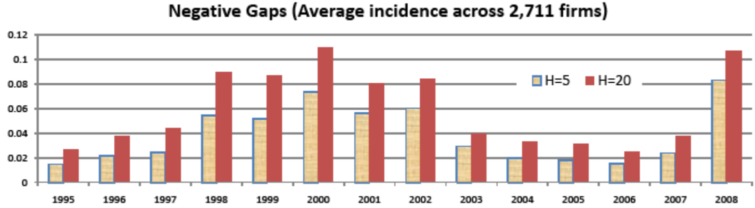
- Union of S&P400, S&P500 and S&P600
- January 1995 to December 2008 (plus 10 years before for parameter estimation)
- Key identifier is the 9-digit CUSIP (from CRSP)
- 237 firms with more than one CUSIP were discarded
- Initial sample of 2,721 firms (with 8-digit Thomson Reuters, 6-digit RiskMetrics)
- 10 cases where the different CUSIPs cannot be uniquely identified were discarded
- Only December year end firms are used; final sample is about 1000 firms.

Stock Market Data

- CRSP Daily data from January 1, 1995 to December 31, 2008 (plus 10 years before for parameter estimation)
- Closing transaction price (or mid of closing bid-ask prices if closing price is not available)
- Traded volume
- Stock return

Gap incidence indicates how many times a firm experienced a gap for that year (i.e. total number of gaps divided by the number of trading days in that year)





Stock Market Liquidity Measure

Roll estimator

$$\text{Roll} = \begin{cases} 2\sqrt{-cov\left(\Delta P_t, \Delta P_{t-1}\right)} & \text{for } cov\left(\Delta P_t, \Delta P_{t-1}\right) < 0 \\ 0 & \text{otherwise} \end{cases}$$

Spread

$$\begin{aligned} \text{Round Trip Spread} &= ask - bid \\ \text{Sell Side Spread} &= \begin{cases} ask - close & \text{for } ask > close \\ 0 & \text{otherwise} \end{cases} \\ \text{Buy Side Spread} &= \begin{cases} close - bid & \text{for } close > bid \\ 0 & \text{otherwise} \end{cases} \end{aligned}$$

Stock Market Liquidity Measure (cont'd)

Zero returns

$$\begin{aligned} \text{Zero1} &= \frac{\#\text{ days with zero returns}}{\#\text{ trading days in a month}} \\ \text{Zero2} &= \frac{\#\text{ positive-volume days with zero returns}}{\#\text{ trading days in a month}} \end{aligned}$$

Amihud price impact measure

$$\text{Amihud} = \frac{\text{absolute stock return}_t}{\text{adjusted \$Volume}_t}$$

Trading Volume: Removal of Outliers

- Outlier; V_t is replaced by V_{t-1} if

$$\ln V_t \notin \left[m_t - 3s_t; m_t + 3s_t\right],$$

  where m_t and s_t are the mean and the standard deviation of $\ln V_t$ respectively over the previous 120 days.
- Adjustment commences on 121st day of the sample period if the company data starts from 1/1/1995.

Trading Volume: Trend adjustment

- For $T = 252$, all 252 trading volume values are revised

$$
\begin{aligned}
V_t^a &= \exp\left(\ln V_t - \widehat{\ln V_t}\right) \\
\ln V_t &= \alpha + \beta t + \varepsilon_t \qquad \text{for } t = T - 251, \cdots, T \\
\widehat{\ln V_t} &= \alpha + \beta t
\end{aligned}
$$

- For $T = 253, \cdots$, α and β are re-estimated but only the Tth observation is revised as the T rolls one day forward

$$V_T^a = \exp\left(\ln V_T - \alpha + \beta T\right)$$

- Adjustment commences on 252th day of the sample period if the company data starts from 1/1/1995.

Annualised Liquidity Measures

- For each firm, average daily liquidity measures across the year to get annual average
- 66% of firms have December year end
- 6% have year end $+/-$ one month from December
- 28% (i.e. 10-66-6) of firms have a varying degree of fiscal vs. calendar year mismatch issue

Liquidity Measures: Summary Statistics

Winsorized illiquidity variables.

Illiquidity measures	*Mean*	*StdDev*	*Min*	*Max*	*Skewness*
Roll measure	0.237	0.414	0.000	11.959	6.985
Round trip spread	0.949	0.943	0.013	30.142	8.082
Sell side spread	0.464	0.471	0.005	14.170	8.140
Buy side spread	0.486	0.476	0.000	15.973	8.016
Zeros1	0.060	0.072	0.000	0.778	1.985
Zeros2	0.059	0.071	0.000	0.778	1.973
Amihud	0.023	0.024	0.000	2.366	37.826

Table. Correlation Coefficients of Illiquidity Measures

	Rspread	Rspread/P	Rs../P_winz	Sspread	Bspread	Roll	Zero1	Zero2	Amihud
Rspread/P	0.126								
Rs../P_winz	0.151	0.958							
Sspread	0.997	0.144	0.171						
Bspread	0.997	0.108	0.130	0.987					
Roll	0.529	0.054	0.068	0.526	0.529				
Zero1	-0.273	-0.032	-0.041	-0.272	-0.271	-0.113			
Zero2	-0.274	-0.032	-0.041	-0.273	-0.272	-0.117	0.994		
Amihud	0.135	0.456	0.494	0.146	0.123	0.072	0.097	0.082	
Am.._winz	0.166	0.557	0.621	0.180	0.151	0.099	0.115	0.099	0.834

Characteristics Data

Four classes of data:

- Firm Characteristics: Market Value, Financial Leverage
- Ownership Characteristics: # Shareholders, # Institutional Investors (ii), ii's shareholdings
- Governance Characteristics: Board Size, Board Composition, Duality, E-index[1]
- Others: # analysts followed, share volume, $volume, volatility, closing price

[1] RiskMetrics G-index uses 24 charter provisions to classify a company into "dictatorship" vs. "democracy". The E-index uses only 6 but better captures managerial protection from shareholders intervention.

Firm Characteristics Data

- *Firm size* as measured by the market value of equity (MV and closing price from CRSP monthly data matched to Compustat fiscal year end)
- *Financial leverage* calculated as ratio of long-term debts to total assets (Compustat - fiscal year basis)

Ownership Characteristics Data

- *# of common shareholders* (annual data from COMPUSTAT)
- *# of institutional investors* (average of "effective" quaterly data from Thomson Reuters)
- *Institutional investors' shareholdings* (from Thomson Reuters 13F)
  - Calculated as the ratio of sum of all shares held by IIs to the total shares outstanding in million for each quarter
  - Derive annual figure as the quarterly average

Governance Characteristics Data

- *Board size* defined as the total number of directors (RiskMetrics)
- *Board composition* calculated as the ratio of non-executive directors to board size (RiskMetrics)
- *Duality*: '1' if the CEO is also the Chairman and '0' otherwise (RiskMetrics)
- *Entrenchment Index* (E-Index, downloaded from Bebchuk's Harvard Business School web site)

Other Characteristics Data

- *# of analysts* following the company is proxied by # year-1 earning forecast
  - IBES histroy file (Datastream)
  - Mannually match CUSIP and ISIN code,
  - Cases where ISIN code cannot be identified are treated as missing
- *$volume* is the share price $\times$ share volume. The annual figure is derived from annual average of daily $volume.
- Annual *share volume* is the annual average of daily share volume.
- Annual *volatility* is the standard deviation of daily stock returns (from CRSP) of the year.
- Annual *closing price* (Compustat)

Firm's Characteristics Data: Summary Statistics

Variables with skewness great than 5 are log transformed.

	Mean	*StdDev*	*Min*	*Max*	*Skewness*
Market value	5835	20728.3	1.937	511887.1	10.512
Market Value (log)	7.104	1.671	0.661	13.146	0.268
Leverage	0.189	0.188	0	4.394	2.272

Ownership Characteristics Data: Summary Statistics

Variables with skewness great than 5 are log transformed.[2]

	Mean	*StdDev*	*Min*	*Max*	*Skewness*
# Shareholders	29.411	318.50	0	26028.29	59.624
# Shareholders (log)	1.184	2.101	−6.908	10.167	−0.374
# of IIs	184.780	188.401	1	1637	2.716
Shareholdings of II	0.625	0.254	0	1	−0.601

[2] A minimum shareholding threshold applies in order to log a shareholder. Hence, it is possible to have the # of shareholders equal to zero if the ownship structure is very dispersed.

Governance Characteristics Data: Summary Statistics

Variables with skewness great than 5 are log transformed.[3]

	Mean	*StdDev*	*Min*	*Max*	*Skewness*
Board Size	9.548	2.872	3	39	1.103
Board Composition	0.796	0.113	0.2222	1	−1.288
CEO is Chairman	0.763	0.425	0	1	−1.236
E-index	2.078	1.581	0	6	0.101

[3] Where Board Composition is equal to 1, it means non-executive chairman runs the Board. CEO attends by invitation but is not a member.

Other Data: Summary Statistics

Variables with skewness great than 5 are log transformed.

	Mean	*StdDev*	*Min*	*Max*	*Skewness*
# Analysts	9.568	7.187	1	45	1.183
# Ave $volm (m)	38.984	133.823	0.0063	5537.701	14.783
# Ave $volm (log)	1.979	1.905	-5.067	8.619	-0.062
Ave ShareVolm	1144736	3722734	658.419	$132m$	11.701
Ave ShareVolm (log)	12.622	1.583	6.490	18.700	0.116
Annual Volatility	0.029	0.016	0	0.290	2.335
Close price	30.823	28.983	0.098	983.02	10.649
Close price (log)	3.138	0.838	-2.367	6.891	-1.048

Tabe. Correlation among Firm Characteristics Variables

	MV	ln_MV	Assets	ln_Assets	Lever..	#Sh..	ln_#Sh..	ln_#Sh../As..	#ii	#ii/Assets	Hold_ii	BSize	CEOchair	BComp	Eindex	Sh..Volm	ln_Sh..Volm	ln_Sh../As..	Voly	BtM	ln_BtM	#Analysts
ln_MV	0.545																					
Assets	0.508	0.324																				
ln_Assets	0.446	0.823	0.411																			
Leverage	-0.043	0.025	-0.011	0.129																		
#Shareholders	0.170	0.126	0.110	0.121	-0.002																	
ln_#Sh..	0.382	0.558	0.257	0.605	0.063	0.231																
ln_#Sh../As..	0.239	0.404	0.136	0.441	0.068	0.203	0.944															
#ii	0.735	0.791	0.430	0.670	0.005	0.123	0.513	0.354														
#ii/Assets	0.630	0.733	0.293	0.535	-0.014	0.098	0.432	0.308	0.959													
Holdings_ii	0.003	0.246	0.004	0.169	0.076	-0.037	-0.071	-0.072	0.263	0.344												
BoardSize	0.282	0.459	0.281	0.603	0.013	0.091	0.463	0.361	0.357	0.262	-0.198											
CEOchairman	0.091	0.156	0.073	0.183	0.032	0.042	0.155	0.117	0.134	0.115	-0.017	0.115										
BoardComp	0.079	0.199	0.082	0.268	0.090	0.030	0.237	0.203	0.185	0.159	0.097	0.257	0.062									
Eindex	-0.077	0.123	-0.056	0.164	0.049	-0.020	0.141	0.155	0.056	0.074	0.127	0.108	0.018	0.229								
SharesVolm	0.502	0.382	0.449	0.345	-0.005	0.113	0.267	0.170	0.556	0.494	0.083	0.124	0.040	0.062	-0.050							
ln_SharesVolm	0.409	0.701	0.267	0.568	0.054	0.090	0.368	0.252	0.690	0.691	0.381	0.185	0.105	0.141	0.087	0.524						
ln_Sh../As..	-0.195	-0.524	-0.188	-0.776	-0.173	-0.061	-0.430	-0.354	-0.319	-0.197	-0.089	-0.560	-0.152	-0.232	-0.201	-0.073	-0.080					
Volatility	-0.130	-0.396	-0.057	-0.394	-0.059	-0.033	-0.305	-0.255	-0.220	-0.190	-0.104	-0.329	-0.015	-0.223	-0.196	0.077	0.087	0.527				
BtM	-0.031	-0.059	-0.080	-0.006	-0.042	-0.005	-0.016	-0.013	-0.042	-0.051	0.012	-0.005	-0.014	0.009	0.013	-0.115	-0.063	-0.038	-0.055			
ln_BtM	-0.163	-0.310	0.032	0.111	0.040	-0.015	0.002	0.009	-0.188	-0.264	-0.003	0.006	-0.003	0.023	0.059	-0.049	-0.181	-0.256	0.022	0.728		
#Analysts	0.418	0.703	0.215	0.592	-0.006	0.117	0.475	0.349	0.611	0.585	0.113	0.339	0.129	0.104	0.040	0.328	0.587	-0.326	-0.190	-0.035	-0.159	
#An../As..	0.267	0.519	0.078	0.322	-0.043	0.068	0.304	0.230	0.421	0.448	0.136	0.152	0.083	0.014	0.018	0.232	0.493	-0.098	-0.080	-0.044	-0.232	0.935

Table. Correlation between Illiquidity Measures and Firm Characteristics

	Rspread	Rspread/P	Rs../P_winz	Sspread	Bspread	Roll	Zero1	Zero2	Amihud	Am.._winz
MV	0.144	-0.065	-0.075	0.140	0.147	0.099	-0.147	-0.148	-0.103	-0.136
ln_MV	0.301	-0.277	-0.310	0.290	0.310	0.162	-0.427	-0.421	-0.354	-0.451
Assets	0.050	0.018	-0.010	0.051	0.049	0.035	-0.092	-0.092	-0.049	-0.072
ln_Assets	0.123	-0.162	-0.198	0.119	0.126	0.086	-0.320	-0.317	-0.340	-0.432
Leverage	-0.113	-0.001	-0.009	-0.111	-0.114	-0.084	0.045	0.049	-0.065	-0.083
#Shareholders	0.009	-0.022	-0.024	0.009	0.009	0.022	-0.030	-0.030	-0.023	-0.029
ln_#Sh..	-0.010	-0.157	-0.170	-0.015	-0.005	0.025	-0.088	-0.085	-0.241	-0.311
ln_#Sh../As..	-0.039	-0.124	-0.137	-0.043	-0.035	0.009	-0.045	-0.042	-0.211	-0.271
#ii	0.201	-0.079	-0.093	0.200	0.201	0.137	-0.354	-0.353	-0.203	-0.258
#ii/Assets	0.223	-0.059	-0.067	0.222	0.222	0.142	-0.394	-0.393	-0.191	-0.241
Holdings_ii	0.127	-0.024	-0.027	0.129	0.124	0.043	-0.463	-0.460	-0.142	-0.170
BoardSize	0.012	-0.192	-0.207	0.005	0.019	0.040	-0.001	0.000	-0.301	-0.308
CEOchairman	0.042	-0.005	-0.004	0.042	0.041	0.014	-0.063	-0.063	-0.019	-0.019
BoardComp	-0.042	-0.139	-0.148	-0.043	-0.041	-0.011	-0.103	-0.102	-0.223	-0.227
Eindex	-0.053	-0.121	-0.127	-0.054	-0.052	-0.025	-0.124	-0.120	-0.181	-0.230
SharesVolm	0.099	0.120	0.103	0.107	0.091	0.061	-0.179	-0.179	0.030	0.021
ln_SharesVolm	0.233	0.110	0.122	0.240	0.225	0.088	-0.541	-0.530	-0.068	-0.080
ln_Sh../As..	-0.018	0.277	0.319	-0.010	-0.026	-0.048	0.107	0.109	0.408	0.485
Volatility	0.205	0.614	0.683	0.220	0.189	0.105	-0.021	-0.024	0.675	0.846
BtM	-0.044	-0.307	-0.146	-0.041	-0.047	-0.011	0.028	0.028	-0.068	-0.029
ln_BtM	-0.267	0.177	0.184	-0.250	-0.281	-0.124	0.119	0.117	0.031	0.048
#Analysts	0.170	-0.074	-0.087	0.171	0.167	0.068	-0.167	-0.164	-0.226	-0.232
#An../As..	0.171	-0.031	-0.035	0.175	0.167	0.053	-0.118	-0.114	-0.127	-0.129

Characteristics Data: Cross Correlation

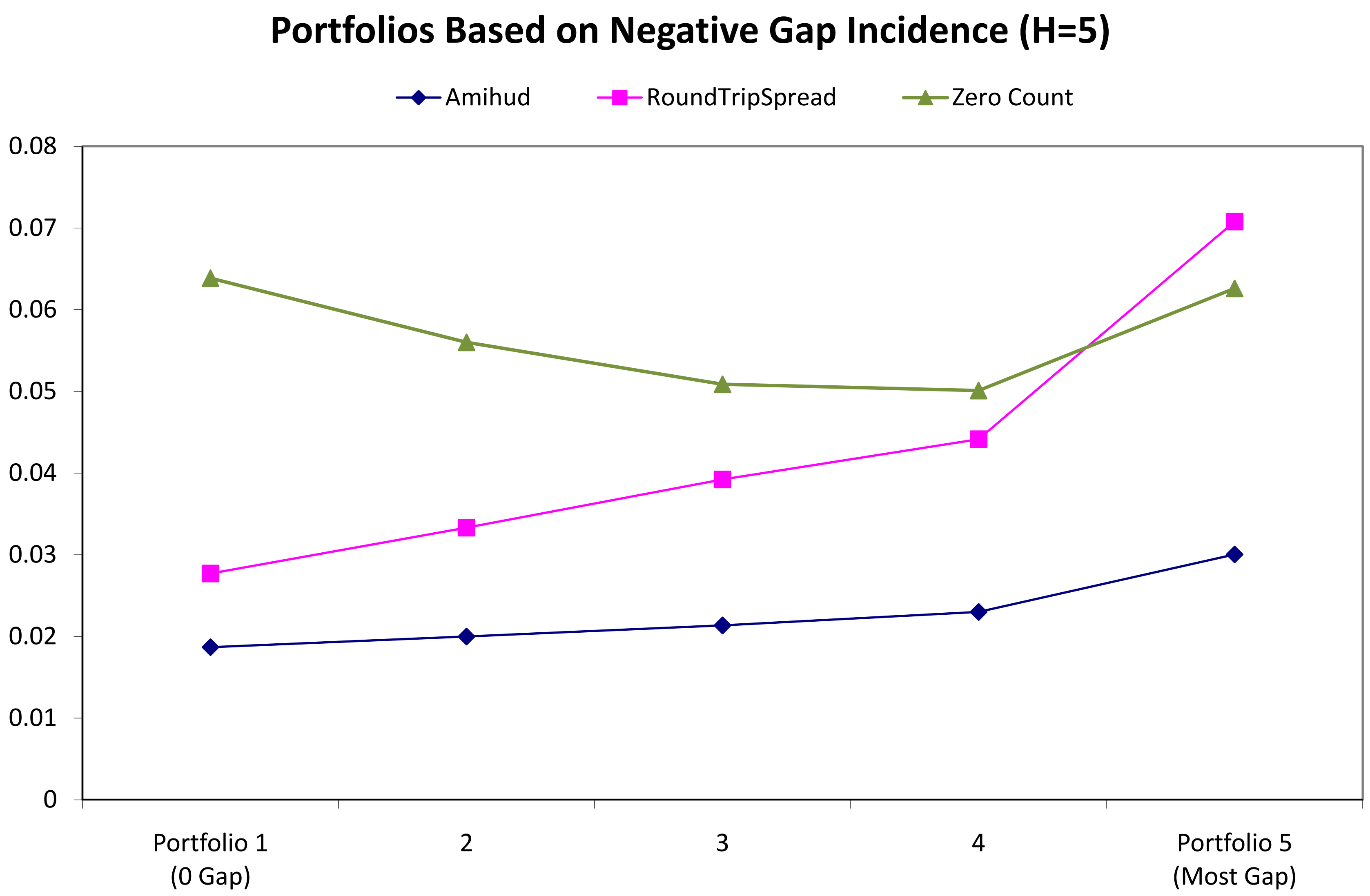
- Firm size as proxied by the market value of equity is highly correlated with the "# of ii" and "$ Volume" traded.
- "$ Volume" traded is highly correlated with "Share Volume", and all liquidity measures. The volume information was subsquently dropped.
- Correlation among "# of ii", "Board Size", "# of Analysts" and "Firm Size" are all relatively strong.

Results

Table. Multivariate Regression of Illiquidity Measures against Firm Characteristics

	Amihud	Round Trip Spread	Zero Count
Ln_MV	-0.0051*** (0.000)	-0.0209*** (0.000)	-0.0185*** (0.000)
Leverage	0.0036*** (0.001)	0.0095** (0.012)	0.0013 (0.750)
Ln_# shareholders	0.0001 (0.246)	0.0004 (0.338)	0.0029*** (0.000)
# of ii	0.0001*** (0.000)	0.0001*** (0.000)	0.0001 (0.163)
Holdings of ii	-0.0109*** (0.000)	-0.0221*** (0.000)	-0.0777*** (0.000)
Board size	-0.0001*** (0.010)	-0.0002 (0.319)	0.0024*** (0.000)
CEO duality	0.0015*** (0.000)	0.0039*** (0.000)	-0.0079*** (0.000)
Board Composition	-0.0113*** (0.000)	-0.0241*** (0.000)	-0.0271*** (0.000)
E index	-0.0004*** (0.000)	0.0003 (0.457)	-0.0038*** (0.000)
# of analysts	0.0001*** (0.000)	0.0010*** (0.000)	0.0015*** (0.000)
Industry Fixed Effects	*Yes*	*Yes*	*Yes*
Firm Random Effects	*Yes*	*Yes*	*Yes*
Year Random Effects	*Yes*	*Yes*	*Yes*
Obs	8314	8314	8314
Wald chi2	1588	571	2152
Prob > chi2	0.000	0.000	0.000

Note: z-values in parentheses. ***, **, * indicates significance at the 1%, 5%, 10% level, respectively. Robust standard errors are reported in parenthesis. Amihud and Spread are winsorized as per Lesmond (2005). Only December year end (only) companies



Portfolios Based on Negative Gap Incidence (H=5)
Amihud
RoundTripSpread
Zero Count
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Portfolio 1
(0 Gap)
2
3
4
Portfolio 5
(Most Gap)

Table. Multivariate Regression of Negative Gap Incident on Firm Characteristics

	H5neg gap	H20neg gap
Ln_MV	-0.0394*** (0.000)	-0.0540*** (0.000)
Leverage	0.0628*** (0.000)	0.0877*** (0.000)
Ln_# shareholders	0.0061*** (0.000)	0.0068*** (0.000)
# of ii	0.0001*** (0.000)	0.0002*** (0.000)
Holdings of ii	-0.0584*** (0.000)	-0.0833*** (0.000)
Board size	0.0019*** (0.000)	0.0029*** (0.000)
CEO duality	0.0102*** (0.000)	0.0162*** (0.000)
Board Composition	-0.0207** (0.015)	-0.0533*** (0.000)
E index	0.0028*** (0.000)	0.0030*** (0.002)
# of analysts	0.0008*** (0.000)	0.0021*** (0.000)
Industry Fixed Effects	*Yes*	*Yes*
Firm Random Effects	*Yes*	*Yes*
Year Random Effects	*Yes*	*Yes*
Obs	8314	8314
Wald chi2	1303	1278
Prob > chi2	0.000	0.000

Note: z-values in parentheses. ***, ** indicates significance at the 1%, 5% level, respectively. Robust standard errors are reported in parenthesis. Only December year end (only) companies

Negative Stock Market Gap and Firm Characteristics

Random effect controlling for industry

Negative Gap	*sign*	
Market Value (Log)	$-$	Smaller firms have more gaps
Leverage (Log)	$+$	High leverage firms gap more
# Shareholders (Log)	$+?$	Free rider in governance vs. free trade
# of ii	$+?$	Free rider in governance vs. free trade
Holdings of ii	$-$	Tighter control means less gaps
Board size	$+$	Larger board size weakens control, more gaps
CEO duality	$+$	CEO-Chairman duality weaken governance
Board composition	$-$	More non-executive directors reduces gaps
E index	$+$	More entrenched managers and lower shareholder protection experience more gaps
# of Analysts	$+$	More analysts means faster information flow and more gaps

Stratified Portfolio Analyses

- Group sample firms into 5 portfolios based on a chracteristic attribute; P1 (P10) has the smallest (largest) value of the attribute
- Regress liquidity measure on gap measure for each portfolio.
- 14 annual observations in each regression from the 14 years of sample data
- Characteristic attributes: 3 ownership characteristics (# ii, holding of ii, # shareholder), 2 firm characteristics (market value, book to market value)

Table. Illiquidity Measures of Portfolios Based on CEO Duality and Gap

		Gap Incidence		
Gap Horizon	CEO Duality	Obs	Mean	Std. Err.
H5 Negative Gap	No	2427	0.03952	0.00125
	Yes	8416	0.05072	0.00077
	Diff		0.01120***	0.00158
H20 Negative Gap	No	2427	0.06590	0.00194
	Yes	8416	0.08026	0.00115
	Diff		0.01436***	0.00238

		Amihud		
	GAP Incidence	Obs.	Mean	Std. Err.
CEO is Chairman	No	2183	0.01376	0.00014
	Yes	6219	0.02008	0.00015
	Diff		0.00632***	0.00027
CEO is not Chairman	No	780	0.01475	0.00023
	Yes	1643	0.02094	0.00030
	Diff		0.00618***	0.00047

		Round Trip Spread		
	GAP Incidence	Obs.	Mean	Std. Err.
CEO is Chairman	No	2190	0.02309	0.00026
	Yes	6226	0.03880	0.00052
	Diff		0.01570***	0.00089
CEO is not Chairman	No	781	0.02501	0.00042
	Yes	1646	0.03979	0.00103
	Diff		0.01477***	0.00153

		Zero Count		
	GAP Incidence	Obs.	Mean	Std. Err.
CEO is Chairman	No	2183	0.03543	0.00113
	Yes	6219	0.04117	0.00061
	Diff		0.00574***	0.00123
CEO is not Chairman	No	780	0.04189	0.00214
	Yes	1643	0.05028	0.00150
	Diff		0.00839***	0.00263

	Negative Gap Incidence			
Quintile Portfolios by MV	Mean	Std. Err.	[95% Conf.	Interval]
P.1	0.0812	0.0018	0.0776	0.0847
P.2	0.0437	0.0011	0.0415	0.0458
P.3	0.0434	0.0011	0.0412	0.0456
P.4	0.0404	0.0010	0.0384	0.0424
P.5	0.0457	0.0011	0.0435	0.0478
P.5 - P.1	-0.03553			

			Amihud	
Quintile Portfolios by MV	GAP Incidence	Obs.	Mean	Std. Err.
	No	886	0.02966	0.0007
P.1	Yes	2561	0.03420	0.0004
	Diff		0.00454***	0.0008
	No	1097	0.02134	0.0004
P.2	Yes	2379	0.02527	0.0003
	Diff		0.00393***	0.0005
	No	1108	0.01771	0.0004
P.3	Yes	2368	0.02170	0.0003
	Diff		0.00399***	0.0004
	No	1042	0.01355	0.0002
P.4	Yes	2449	0.01874	0.0002
	Diff		0.00519***	0.0004
	No	969	0.01221	0.0003
P.5	Yes	2501	0.01680	0.0002
	Diff		0.00459***	0.0003

			Round Trip Spread	
Quintile Portfolios by MV	GAP Incidence	Obs.	Mean	Std. Err.
	No	902	0.04134	0.0011
P.1	Yes	2609	0.07659	0.0019
	Diff		0.03525***	0.0033
	No	1114	0.03079	0.0007
P.2	Yes	2393	0.04563	0.0010
	Diff		0.01484***	0.0015
	No	1118	0.02613	0.0005
P.3	Yes	2390	0.03979	0.0007
	Diff		0.01365***	0.0011
	No	1047	0.02216	0.0004
P.4	Yes	2460	0.03503	0.0006
	Diff		0.01287***	0.0009
	No	981	0.01937	0.0003
P.5	Yes	2520	0.03249	0.0005
	Diff		0.01312***	0.0008

			Zero Count	
Quintile Portfolios by MV	GAP Incidence	Obs.	Mean	Std. Err.
	No	886	0.09874	0.0033
P.1	Yes	2561	0.08988	0.0017
	Diff		-0.00886***	0.0034
	No	1097	0.06688	0.0024
P.2	Yes	2379	0.06224	0.0014
	Diff		-0.00464*	0.0026
	No	1109	0.06262	0.0023
P.3	Yes	2368	0.04879	0.0011
	Diff		-0.01383***	0.0023
	No	1042	0.05276	0.0021
P.4	Yes	2449	0.04358	0.0010
	Diff		-0.00918***	0.0021
	No	969	0.04172	0.0018
P.5	Yes	2501	0.02907	0.0007
	Diff		-0.01265***	0.0016

Figure. Illiquidity Measures of Portfolios Based on Market Values (Gap vs. No Gap)

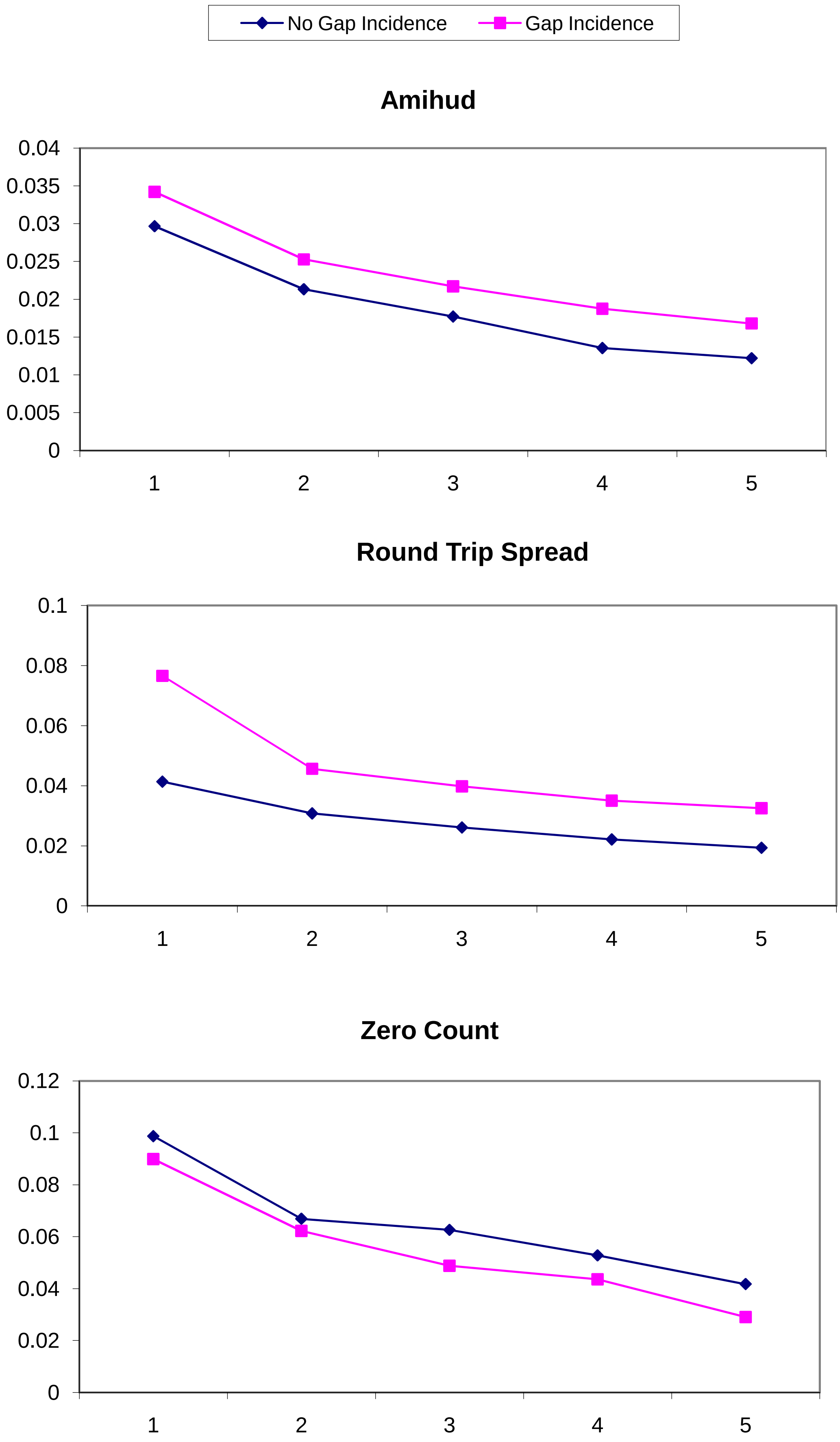


Table. Illiquidity Measures of Portfolios Based on B-t-M, Book to Market Value (Gap vs. No Gap)

	Negative Gap Incidence			
Quintile Portfolios by BtM	Mean	Std. Err.	[95% Conf.	Interval]
P.1 (Growth)	0.03946	0.00106	0.03738	0.04154
P.2	0.03989	0.00105	0.03784	0.04194
P.3	0.04231	0.00102	0.04031	0.04431
P.4	0.04577	0.00114	0.04353	0.04801
P.5 (Value)	0.07817	0.00177	0.07470	0.08165
P.5 - P.1	0.03872			

			Amihud	
Quintile Portfolios by BtM	GAP Incidence	Obs.	Mean	Std. Err.
P.1 (Growth)	No	1148	0.02263	0.0005
	Yes	2229	0.02444	0.0003
	Diff		0.00181***	0.0006
P.2	No	1068	0.01935	0.0005
	Yes	2318	0.02175	0.0003
	Diff		0.00240***	0.0005
P.3	No	999	0.01757	0.0004
	Yes	2405	0.02131	0.0003
	Diff		0.00374***	0.0005
P.4	No	1002	0.01594	0.0004
	Yes	2382	0.02159	0.0003
	Diff		0.00565***	0.0005
P.5 (Value)	No	814	0.01646	0.0004
	Yes	2563	0.02635	0.0004
	Diff		0.00989***	0.0007

			Round Trip Spread	
Quintile Portfolios by BtM	GAP Incidence	Obs.	Mean	Std. Err.
P.1 (Growth)	No	1170	0.03142	0.0006
	Yes	2255	0.04330	0.0008
	Diff		0.01188***	0.0011
P.2	No	1081	0.02870	0.0007
	Yes	2337	0.03971	0.0008
	Diff		0.01102***	0.0012
P.3	No	1003	0.02508	0.0005
	Yes	2419	0.03765	0.0006
	Diff		0.01257***	0.0010
P.4	No	1009	0.02500	0.0006
	Yes	2409	0.04048	0.0009
	Diff		0.01548***	0.0014
P.5 (Value)	No	827	0.02692	0.0010
	Yes	2585	0.06019	0.0015
	Diff		0.03327***	0.0028

			Zero Count	
Quintile Portfolios by BtM	GAP Incidence	Obs.	Mean	Std. Err.
P.1 (Growth)	No	1148	0.04849	0.0020
	Yes	2229	0.03789	0.0010
	Diff		-0.01060***	0.0020
P.2	No	1068	0.05248	0.0021
	Yes	2318	0.04612	0.0011
	Diff		-0.00635***	0.0022
P.3	No	999	0.06418	0.0024
	Yes	2405	0.05096	0.0012
	Diff		-0.01323***	0.0024
P.4	No	1002	0.07251	0.0026
	Yes	2382	0.05958	0.0013
	Diff		-0.01293***	0.0027
P.5 (Value)	No	815	0.08919	0.0034
	Yes	2563	0.07486	0.0015
	Diff		-0.01434***	0.0033

Figure. Illiquidity Measures of Portfolios Based on B-t-M, Book to Market Value (Gap vs. No Gap)

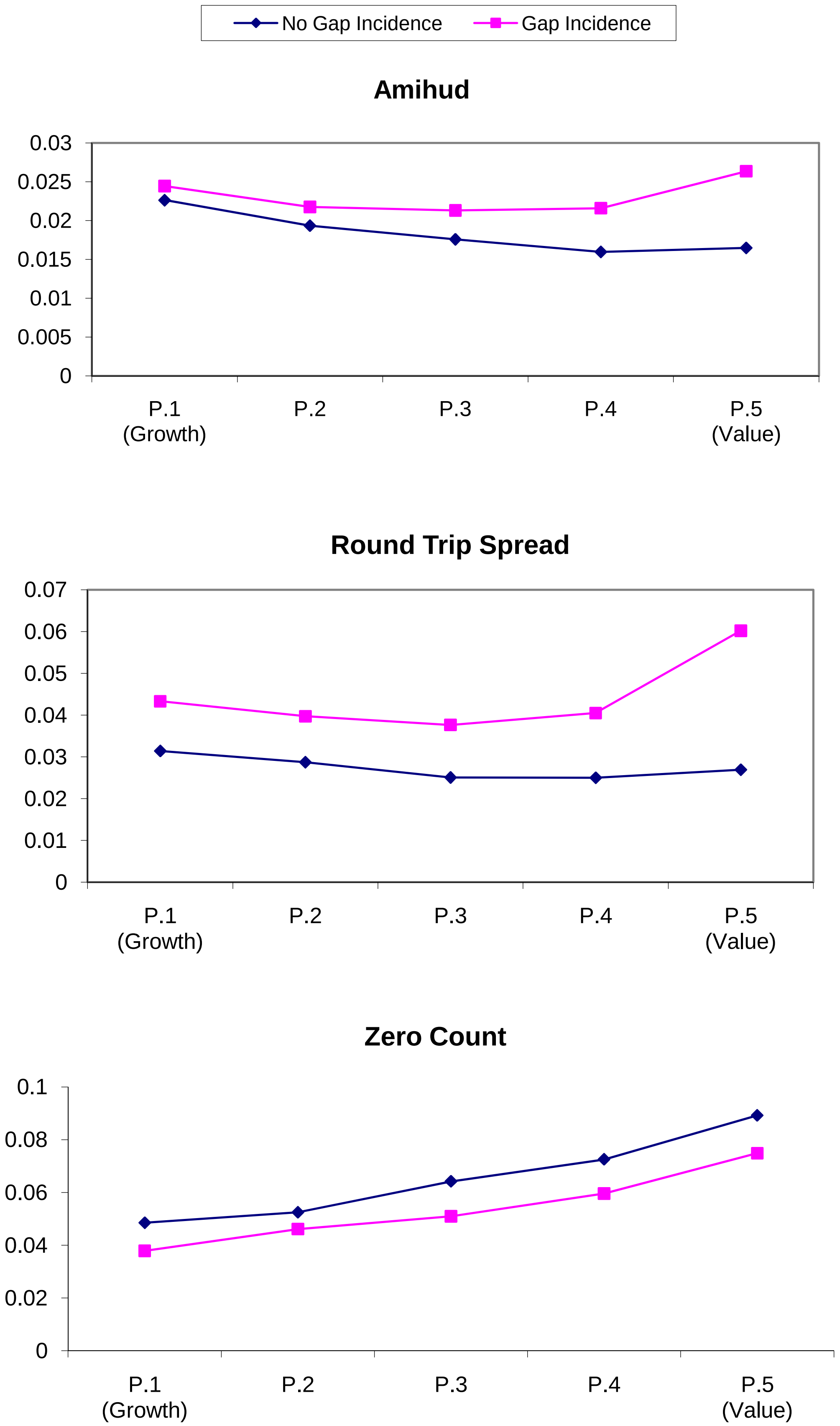


Table. Illiquidity Measures of Portfolios Based on Leverage (Gap vs. No Gap)

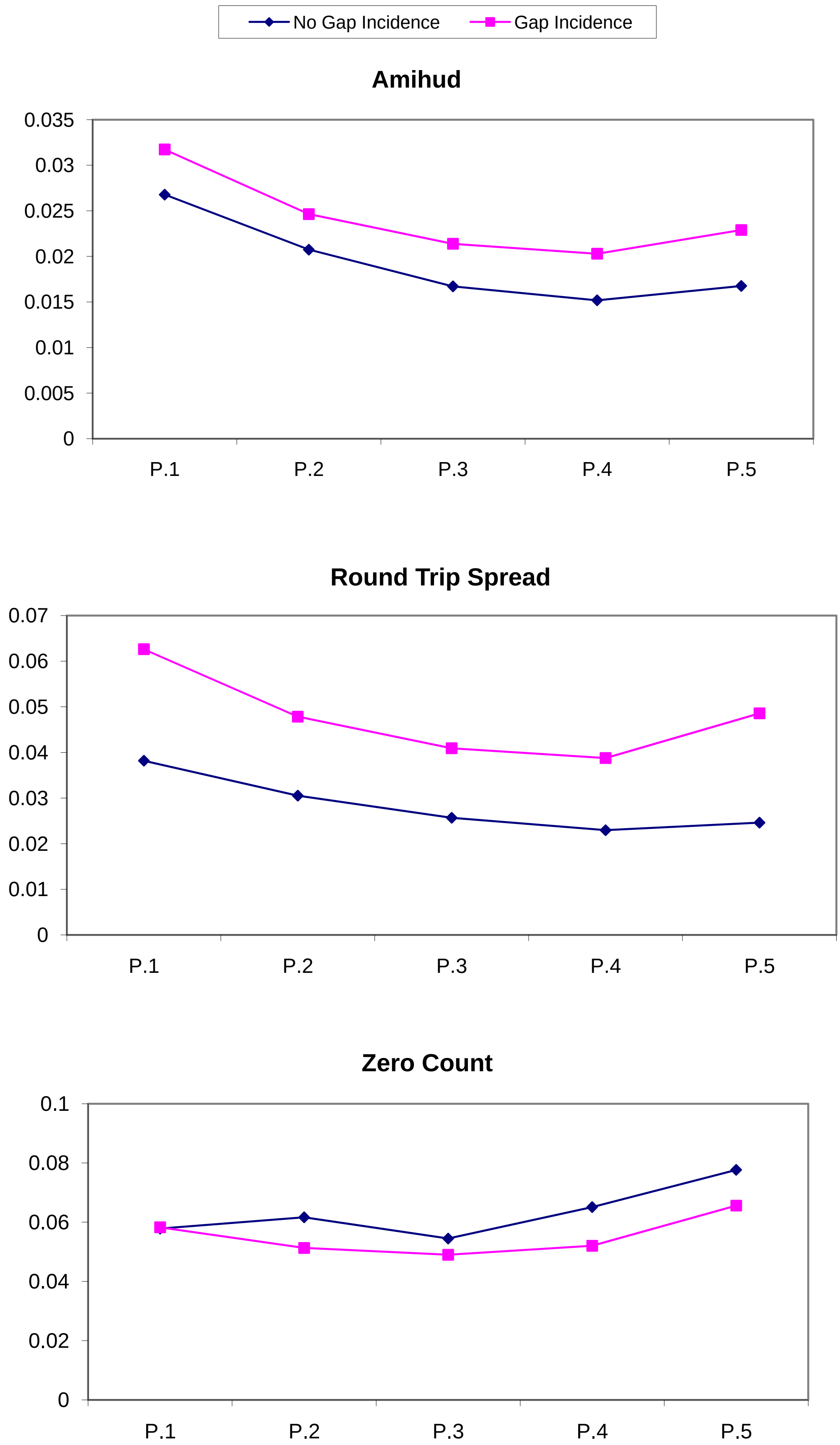
	Negative Gap Incidence			
Zero and Quartile Portfolios by Leverage	Mean	Std. Err.	[95% Conf.	Interval]
P.1	0.04824	0.00164	0.04503	0.05146
P.2	0.04826	0.00117	0.04597	0.05056
P.3	0.04885	0.00118	0.04654	0.05116
P.4	0.04958	0.00117	0.04729	0.05186
P.5	0.05813	0.00142	0.05535	0.06091
P.5- P.1	0.00989			

		Amihud		
Zero and Quartile Portfolios by Leverage	GAP Incidence	Obs.	Mean	Std. Err.
P.1	No	692	0.02678	0.00074
	Yes	1481	0.03173	0.00047
	Diff		0.00496***	0.00086
P.2	No	1173	0.02074	0.00050
	Yes	2601	0.02464	0.00031
	Diff		0.00390***	0.00057
P.3	No	1053	0.01671	0.00035
	Yes	2736	0.02138	0.00026
	Diff		0.00467***	0.00047
P.4	No	1066	0.01518	0.00033
	Yes	2738	0.02029	0.00024
	Diff		0.00511***	0.00044
P.5	No	1113	0.01675	0.00038
	Yes	2676	0.02289	0.00030
	Diff		0.00614***	0.00052

		Round Trip Spread		
Zero and Quartile Portfolios by Leverage	GAP Incidence	Obs.	Mean	Std. Err.
P.1	No	701	0.03818	0.00097
	Yes	1504	0.06262	0.00175
	Diff		0.02444***	0.00265
P.2	No	1201	0.03052	0.00082
	Yes	2628	0.04783	0.00116
	Diff		0.01731***	0.00181
P.3	No	1064	0.02567	0.00072
	Yes	2761	0.04092	0.00089
	Diff		0.01524***	0.00149
P.4	No	1071	0.02295	0.00036
	Yes	2754	0.03877	0.00077
	Diff		0.01582***	0.00126
P.5	No	1118	0.02461	0.00049
	Yes	2692	0.04856	0.00127
	Diff		0.02395***	0.00200

		Zero Count		
Zero and Quartile Portfolios by Leverage	GAP Incidence	Obs.	Mean	Std. Err.
P.1	No	692	0.05784	0.00279
	Yes	1481	0.05827	0.00160
	Diff		0.00043	0.00302
P.2	No	1173	0.06166	0.00217
	Yes	2601	0.05130	0.00119
	Diff		-0.01036***	0.00229
P.3	No	1053	0.05448	0.00219
	Yes	2736	0.04899	0.00111
	Diff		-0.00548**	0.00225
P.4	No	1066	0.06510	0.00244
	Yes	2738	0.05204	0.00117
	Diff		-0.01306***	0.00241
P.5	No	1114	0.07766	0.00270
	Yes	2676	0.06560	0.00149
	Diff		-0.01206***	0.00289

Figure. Illiquidity Measures of Portfolios Based on Leverage (Gap vs. No Gap)



2SLS Results on IL=> GAP

	H5neg gap	H20neg gap
Amihud	+	+
Rspread / Price	+	+
Zero2	+	+

2SLS Results on GAP => IL

	Amihud	Rspread/ Price	Zero Count
H5neggap	+	+	+
H20neggap	+	+	+

End