Dynamic Ownership, Private Benefits, and Stock Prices

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Why should we care?

Controlling shareholders (CS) enjoy private benefits (PB) from holding block of shares

- Social prestige, private amenities, discretion

Private Benefits affect Stock Prices

1. **Size Channel**:
   PB impact on size of the stake

   > Amount of shares floating on the market

2. **Information Channel**:
   CS' ownership policy less affected by firm fundamental

   > CS' ownership policy less informative about firm fundamental

What I do

Dynamic model of optimal shareholding

- Heterogeneity between large/small shareholders
- Asymmetric information and private benefits
- Equilibrium ownership policy and stock price

Structural estimation using

- Time-series of stock prices
- CS' ownership policy

$\Downarrow$

$\rightarrow$ Quantify PB in terms of equity value

$\rightarrow$ Measure price impact of PB (counterfactual analysis)

What I find

Main Results:

1. PB are around 2% of equity value
2. CS generally have positive impact on stock prices
3. Larger positive impact during 2011-2012
4. Larger positive impact with corporations as CS

Economic Implications:

(1,2) Extraction of PB no detrimental for residual shareholders

(3) Beneficial effect of CS during negative cycles

(1,4) Evidence of synergistic effect

Literature vs Contribution: Theory

Ownership Policy of Large Shareholders

- Gomes (2000) (Activism and Asymmetric Information)
- DeMarzo and Urosevic (2006) (Activism and Moral Hazard)
- Collin-Dufresne and Fos (2016) (Activism and Asymmetric Information)

- Heterogeneity large/small shareholders

⇒ **Persistent Trading by Large Shareholder**

! Empirical evidence: frequency of change in stakes of CS

! My model: Asymmetric Information and PB

⇒ Infrequent trading implied by extraction of PB

Literature vs Contribution: Estimation

Measuring Private Benefits

- Voting Premium (Voting Share - Non-Voting Share)
  [Zingales (1995), Nenova (2003), Benos and Weisbach (2004)]
- Block Premium (Block price - Market Price)
  [Barclay and Holderness (1989), Nicodano and Sembenelli (2004)]
- Structural Estimation of block pricing model
  [Albuquerque and Schroth (2010)]
- Evidence on Italy
  [Zingales (1995), Nenova (2003),
  Nicodano and Sembenelli (2004), Dyck and Zingales (2004)]

- PB priced in the controlling block acquisition

⇒ **Information on price/size of controlling block purchase**

! PB may impact on the ownership policy

! My approach: model for ownership dynamics of CS

⇒ Information on CS' ownership policy

Literature vs Contribution: Results

- **Price Impact of Private Benefits**
  [Lippi and Schivardi (2014)]

  → Counterfactual analysis by model pricing equations (PB=0)

- **Price Impact of Controlling Shareholders**
  [John et al. (2008), Faccio et al. (2011)]

  → Counterfactual analysis by model pricing equations (CS=0)

- **Stake Valuation by Controlling Shareholders**
  [Roger and Schatt (2016), Odegaard (2009)]

  → CS' Certainty Equivalent by model optimality conditions

The Setup

Firm Cash-Flows:

$$dD_t = \mu_t dt + \sigma_D dZ_t,$$
$$d\mu_t = \sigma d\tilde{Z}_t,$$

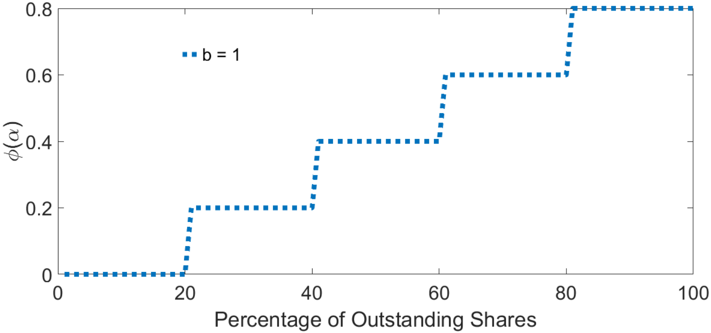
Firm Shareholders:

- Continuum of (risk-averse) Marginal Investors (MI)
  - MI have heterogenous prior on μ_t
  - Continuous trading on their priors
  - Bayesian update on μ_t
- One Large (risk-averse) Shareholder (CS)
  - Perfect knowledge on μ_t
  - May trade at discrete dates τ
  - Extracts PB from stake accruing to total wealth

Private Benefits Function

$$\phi(\alpha) = b * \alpha_j,$$

if $\alpha_j \leq \alpha < \alpha_{j+1}$



Investors learning

Marginal investors learn about μ_t (Bayesian heterogenous update)

- Continuous common (noisy) signal $dD_t = \mu_t dt + \sigma_D dZ_t$

$$\bar{\mu}_{t+dt} = (1 - \bar{k}_t)\bar{\mu}_t + \bar{k}_t dD_t$$

$\bar{k}_t$ = average reaction to the new signal

Proof1

- Discrete common (noisy) signal $\alpha_{L,\tau}$

$$\bar{\mu}_\tau = \bar{\mu}_{t<\tau} + \bar{g}(\alpha_{L,\tau} - \alpha_{L,\tau}(\bar{\mu}_{t<\tau}))$$

$\bar{g}$ = average reaction to the CS' ownership policy

Proof2

Model Equilibrium

- **Optimality Condition of CS** (Share Benefits = Total Cost of a Share)

$$V^{'} = P_\tau + (\alpha_{L,\tau} - \alpha_{L,\tau^-})P^{'},$$

V = Present value of net benefits flow

Net benefits = Risk-adjusted dividends + private benefits

- **Equilibrium Stock Price**

$$P_\tau = \int_\tau^\infty e^{-r(s-\tau)}[\underbrace{\bar{\mu_\tau}}_{\textbf{Information Channel}} - \underbrace{\rho_\tau}_{\textbf{Size Channel}}]ds,$$

$$\rho_\tau = (1 - \alpha_{L,\tau})a^I\sigma_D^2 r$$

Proof3

Model Results

Asymmetric Information and No PB

- CS always tempted to trade on mispricing of MI
- MI learn from CS' trading
- CS (always) trades (gradually) towards optimal risk-sharing allocation

  [equivalent to DeMarzo and Urosevic (2006)]

Asymmetric Information and PB

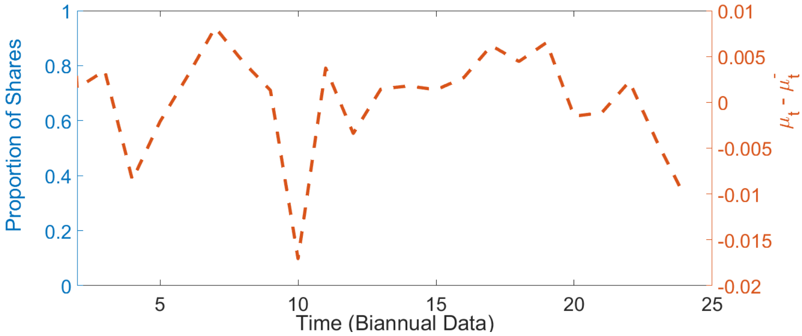
- CS only trades when mispricing is large enough

Buys $\rightarrow$ Gain in PB offsets (total) trading costs

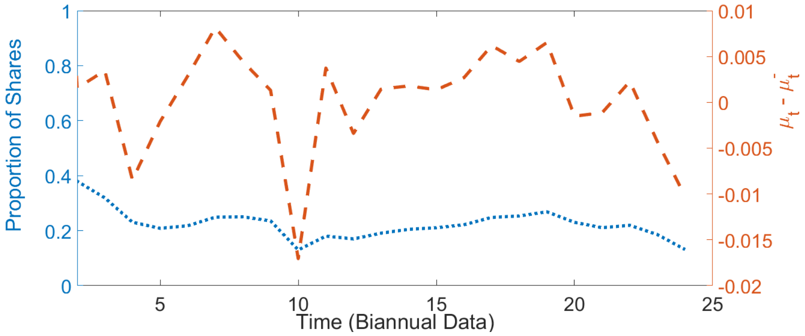
Sells $\rightarrow$ Loss in PB offsets (net) trading gains

AI and No PB: Mispricing

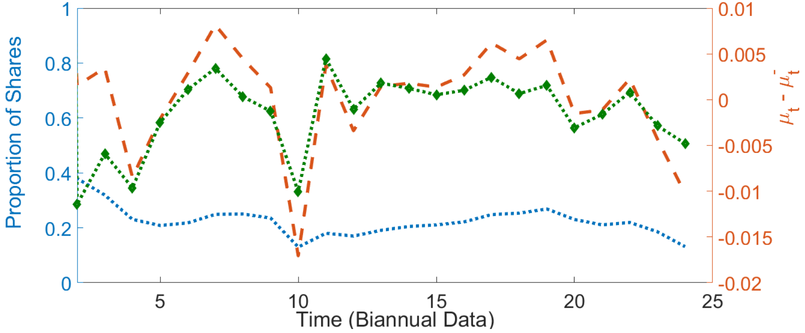
▸ Numerical Setup



AI and No PB: Ownership policy

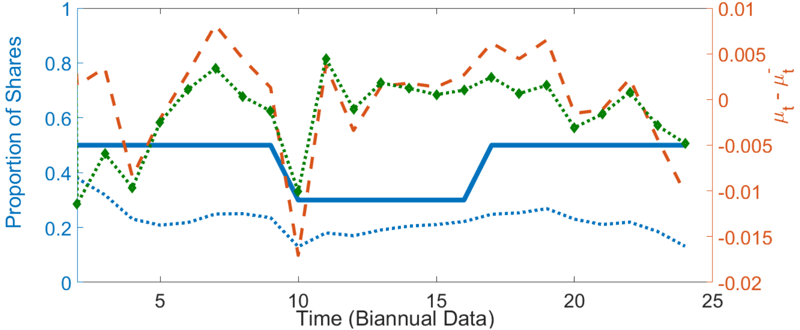


AI and No PB: Learning



AI and PB: Ownership Policy

▸ Updating Weight



Data

Public companies listed in Italian Stock Exchange (Non-financial firms) (2004-2016)

- Ownership Stake of Controlling Shareholder (Biannual, TR + CONSOB)
- Stock Prices (Daily and Biannual, Datastream)
- Earnings-per-Share (Annual, Datastream)

Sample Selection

- Same Largest Shareholder for $\geq$ 75% of observations
- Complete Time-Series on all data
- Final Sample: 77 Firms
- CS' type: 34 Corp, 30 Ind, 10 Gov, 3 Fin

Variable	Mean	Median	STD	p10	p90
Stake Level (%)	48.63	53.29	17.53	18.88	66.96
N of Trades	3.33	3	2.34	1	6
Daily Turnover	0.38	0.23	0.60	0.02	5.26
Stake Change (%)	4.27	1.17	0.41	0.00	4.35

Ownership Policy: Empirical Facts

- CS change their stakes infrequently

  → Change in stake observed in 18% of total observations

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- When they do, they trade big blocks of shares

  → The mean (median) change in stake is 4.27% (1.17%)

Ownership Policy: Empirical Facts

- CS change their stakes infrequently

  $\rightarrow$ Change in stake observed in 18% of total observations

- When they do, they trade big blocks of shares

  $\rightarrow$ The mean (median) change in stake is 4.27% (1.17%)

- They rarely trade small blocks

  $\rightarrow$ Change $< 1\%$ observed in 7.79% of total observations

Estimation Problem

For each firm:

Quantities to estimate:

- Model Parameters

$$\theta = \{\sigma_D, \sigma, a^L, \bar{g}(0), \sigma_\epsilon^2, b\}$$

- Latent Variables

$$X_t = \{\mu_t, \bar{\mu_t}\}$$

Observable Variables:

- Daily Stock Prices
- Biannual Stock Prices
- Biannual Stakes
- Annual Earnings-per-Share

Equilibrium Conditions:

- Market Clearing
- Equilibrium Stock Price
- Optimality of CS

First Step: $\{\sigma_D, \sigma, \mu_t, \bar{\mu_t}\}$

- **State Diffusion**: from market clearing $\int_i d\alpha_{i,t} = 0$,

$$E_t[\bar{\mu}_{t+1}] = (1 - \bar{k})\bar{\mu}_t + \bar{k}\mu_t,$$

$$E_t[\mu_{t+1}] = \mu_t$$

- **Observable Equation**: Stock Price

$$P_t = [-(\sigma_D^2 a^I r(1 - \alpha_{L,t})) + \bar{\mu}_t]/r$$

- **Additional Restriction**: from FCF dynamics

$$var(\delta(dD_t)) = var(\delta(d\mu_t)) + 2var(dD_t - \mu_t) = \sigma^2 + 2\sigma_D^2$$

$\Rightarrow$ **Kalman Filter**, with daily stock prices

- Predict P_t with prior on $X_t = \{\mu_t, \bar{\mu_t}\}$
- Obtain prediction error using actual prices
- Update X_t based on prediction error $\Rightarrow$ Maximum Likelihood on the errors

$$e_t = e(a^I, \sigma, \sigma_D, X_t)$$

Second Step: $\{a^L, \bar{g}(0), \sigma^2_\epsilon\}$

One equation for stock price at τ (disclosure dates),

$$P\tau = [-(\sigma^2_D a^I r(1 - \alpha_{L,\tau})) + \bar{\mu}_\tau]/r,$$

by eliminating all the remaining endogenous quantities, only function of

- Stake of CS: $\{\alpha_{L,\tau}\}$
- Exogenous variables: $\{a_L, \bar{g}(0), \sigma^2_\epsilon\}$

$\Rightarrow$ **Kalman Filter**, with biannual stock prices

- Predict P_τ using $\bar{\mu}_\tau$
- Obtain prediction errors using actual prices $\Rightarrow$ Maximum Likelihood on the errors

$$e_\tau = e(a_L, \bar{g}(0), \sigma^2_\epsilon, \bar{\mu}_\tau)$$

Identification: b

Lower and Upper bounds for b

The actual choice $\alpha_{L,\tau}$ is not optimal without PB

$\Rightarrow$ Without private benefits CS chooses $\alpha_{m,\tau}$

Lower Bound

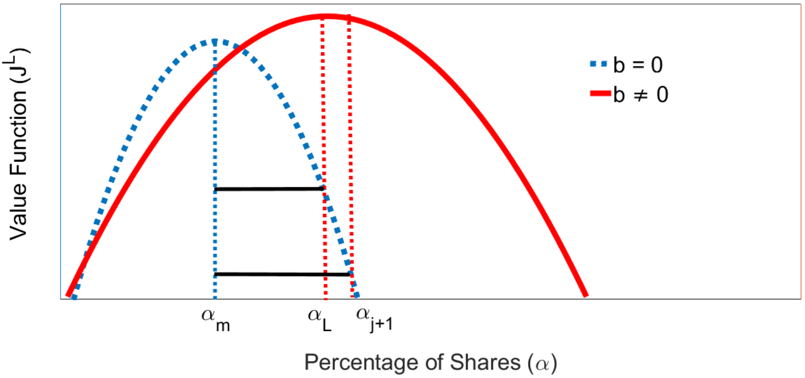
The gain in PB must be at least equal to the loss in the marginal utility

Why does not the CS jump to higher thresholds?

Upper Bound

PB are not sufficient to jump to higher threshold given loss in marginal utility

Identification: b



Measuring Price Impact

Counterfactual Analysis:

1. Stock Price without PB: $\{P_\tau^m\}$

2. Stock Price without CS : $\{P_\tau^n\}$

$$P_\tau^m = P\left(\alpha_{L,\tau} = \alpha_{m,\tau}, \bar{\mu}_\tau = \bar{\mu}(\alpha_{m,\tau}), \sigma_\epsilon^2 = 0\right),$$

$$P_\tau^n = P\left(\alpha_{L,\tau} = 0, \bar{\mu}_\tau = \bar{\mu}_{t<\tau}\right),$$

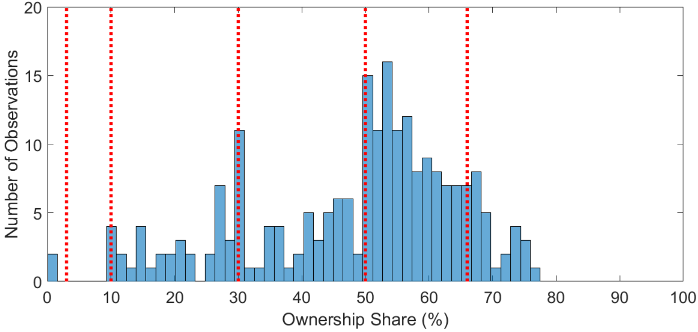
Price Impact

$$\psi^m = \frac{P_\tau - P_\tau^m}{P_\tau^m},$$

$$\psi^n = \frac{P_\tau - P_\tau^n}{P_\tau^n},$$

PB thresholds

Ownership Share	Right/Commitment
3%	Obligation to stake disclosure
10%	Right to call shareholders meeting
30%	Obligation to launch takeover
50%	Company control
66%	Right to call extraordinary meeting



Model Fit

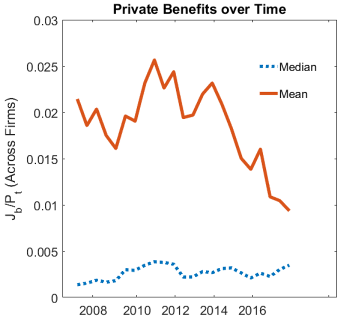
	Mean	Median	Std	10th pct	90th pct
σ	0.024	0.016	0.028	0.002	0.051
σ_D	0.279	0.210	0.294	0.038	0.639
a_L	2.664	2.137	1.452	1.131	4.999
b	0.001	0.000	0.008	-0.003	0.009
$\bar{g}(0)$	0.137	0.041	0.172	0.000	0.493
σ_ϵ^2	0.584	0.764	0.405	0.000	0.998

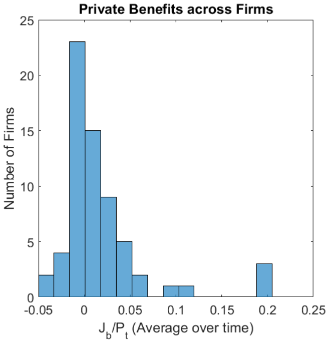
	Mean		Median	
	Actual	Fitted	Actual	Fitted
Stock Price volatility	1.98	2.05	1.22	1.19
CS' Trading volatility	0.029	0.031	0.016	0.014
Trade (% of shares)	7.73	11.73	3.64	5.46

	Actual	Fitted
N of Trades $\geq 1\%$	10.76%	6.63%

- Good performance in replicating features of data
- Prediction of larger blocks trades, with lower frequency

Private Benefits

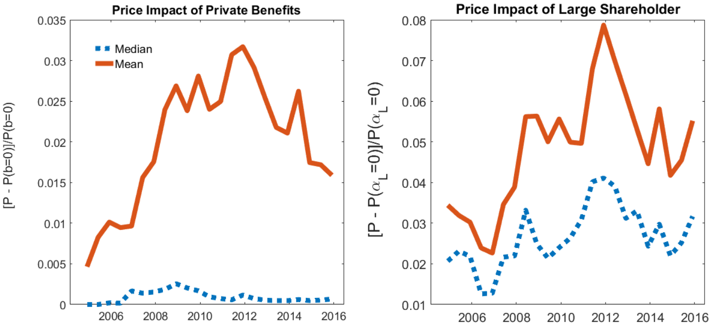




- PB around 2% of equity value
- Positive skewness in distribution of PB
- 50% of CS extract PB $<$ 1% of equity

Table

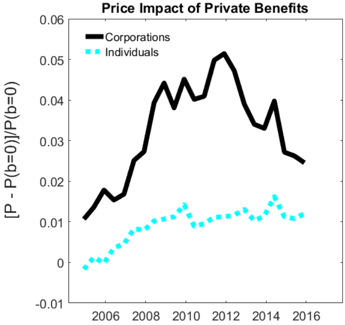
Price Impact

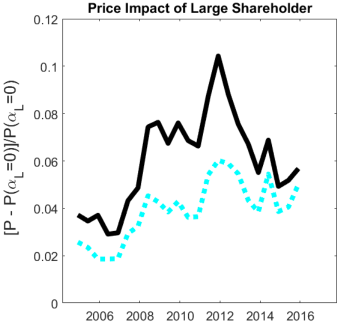


- General positive impact on stock prices
- Heterogeneity and positive skewness
- Larger during 2011-2012 crisis

▸ Table

Type of CS

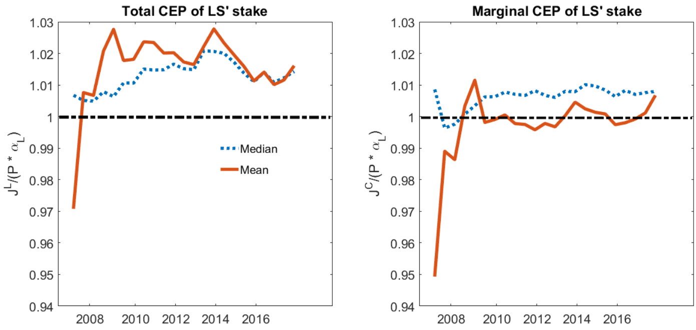




- Larger impact with corporations as CS

▸ Table

Certainty Equivalent



- Valuation of a share out of market price
- Not observable without trade

▸ Table

Implications & Conclusion

- Dynamic model of optimal shareholding (AI and PB)
- Model restrictions to
  - **Quantify PB of Controlling Shareholders**
  - **Measure the price impact of PB and CS**

Beneficial effect of CS for residual shareholders
[Negative Cycles and Corporations]

Estimation Results

back3

Table: . Private Benefits and Stock Price

	Mean	Median	10th pct	90th pct
Panel A: All Sample				
J^L/P	1.015	1.014	0.984	1.053
J_b/P	0.018	0.003	-0.015	0.054
J_C/P	0.997	1.006	0.945	1.054
ψ^m	0.020	0.002	-0.021	0.096
ψ^n	0.048	0.028	-0.001	0.128
Panel B: Corporations				
J^L/P	1.018	1.022	0.982	1.063
J_b/P	0.029	0.009	-0.016	0.105
J_C/P	0.989	1.002	0.865	1.052
ψ^m	0.032	0.003	-0.018	0.127
ψ^n	0.060	0.046	0.001	0.149
Panel C: Individuals				
J^L/P	1.013	1.014	1.001	1.023
J_b/P	0.011	0.001	-0.010	0.011
J_C/P	1.002	1.007	0.967	1.059
ψ^m	0.009	0.002	-0.026	0.029
ψ^n	0.039	0.021	-0.002	0.132

Numerical Simulations

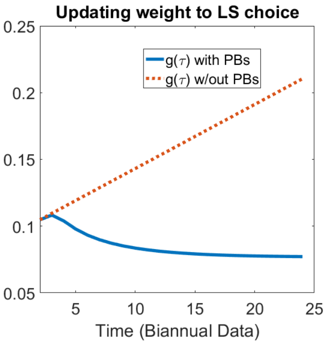
back1

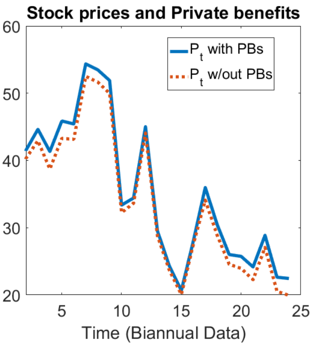
Table: . Parameters Estimates: Simulation Study

	True	Mean	Median	10th pct	90th pct
σ	0.1	0.093	0.093	0.087	0.099
σ_D	0.2	0.202	0.199	0.132	0.274
a_L	8	8.71	7.97	7.10	10.36
b	0.02	0.019	0.021	0.007	0.027
$\bar{g}(0)$	0.1	0.097	0.099	0.082	0.105
σ_ϵ^2	0.2	0.189	0.188	0.138	0.245

Noise and Impact

back2





Proof 1

$$\alpha_{i,t} = \frac{\mu_{i,t} - \bar{\mu_t} + \rho}{ar\sigma^2}, \rho_t = (1 - \alpha_{L,t})a^I r\sigma^2$$

$$d\alpha_{i,t} = \frac{1}{ar\sigma^2}(d\mu_{i,t} - d\bar{\mu_t})$$

$$d\mu_{i,t} = k_i \eta_{i,t}, k_i = \frac{\sigma_i^2}{\sigma_D^2 + \sigma_i^2},$$

$$\eta_{i,t} = dD_t - E_{i,t}[dD_t], E_{i,t}[dD_t] = \mu_{i,t}$$

Since,

$$\int_i d\alpha_{i,t} = 0$$

$$\int_i d\mu_{i,t} di = M d\mu_t \rightarrow d\mu_t = \frac{1}{M}\int_i (k_i(dDt - E_{i,t}(dD_t))) = \bar{k}(dD_t - \mu_t)$$

▸ Investors Learning

Proof 2

$$d\alpha_{i,\tau} = \frac{1}{ar\sigma^2}(d\mu_{i,\tau} - d\bar{\mu_\tau})$$

$$d\mu_{i,\tau} = g_i(\tau^-)(\alpha_{L,\tau} - E_{t<\tau}(\alpha_{L,\tau})), d\bar{\mu}_\tau = \bar{\mu}_\tau - \bar{\mu}_{t<\tau}$$

Since,

$$\int_i d\alpha_{i,\tau} = 0 \to \int_i d\mu_{i,\tau} di = M d\bar{\mu}_\tau$$

$$d\bar{\mu}_\tau = \frac{1}{M}\int_i (g_i(\alpha_{L,\tau} - E_{t<\tau}(\alpha_{L,\tau})))di = \bar{g}(\tau^-)(\alpha_{L,\tau} - E_{t<\tau}(\alpha_{L,\tau}))$$

$$\alpha_{L,\tau} = \frac{\mu_t - \bar{\mu}_\tau + (1+\alpha_{L,\tau^-})a^I\sigma_D^2 r + \phi(\alpha_{L,\tau})}{2a^I\sigma_D^2 r + a^L\sigma_D^2 r}$$

$$E_{t<\tau}(\alpha_{L,\tau}) = \frac{(1+\alpha_{L,\tau^-})a^I\sigma_D^2 r}{2a^I\sigma_D^2 r + a^L\sigma_D^2 r}$$

$$g_i(\tau^-) = \frac{\alpha^\mu_{L,\tau^-}\sigma_i^2}{(\alpha^\mu_{L,\tau^-})^2\sigma_i^2 + \sigma_\epsilon^2}, \alpha^\mu_{L,\tau} = \frac{\partial \alpha_{L,\tau}}{\partial \mu_t}$$

▸ Investors Learning

Proof 3

CEP

$$\frac{\alpha_{i,\tau}\mu_{i,\tau} - \frac{1}{2}\alpha_{i,\tau}^2 a^i \sigma_D^2 r}{r}$$

CEP $=$ cost of share

$$\frac{\alpha_{i,\tau}\mu_{i,\tau} - \frac{1}{2}\alpha_{i,\tau}^2 a^i \sigma_D^2 r}{r} = \alpha_{i,\tau} P_\tau$$

$$\alpha_{i,\tau} = \frac{\mu_{i,\tau} - rP_\tau}{ar\sigma^2}$$

Since,

$$\int_i \alpha_{i,\tau} = (1 - \alpha_{L,\tau})$$

Substitute $\alpha_{i,\tau}$ and solve for P_τ

$$P_\tau = \frac{\bar{\mu}_\tau - (1 - \alpha_{L,\tau}) * a^I \sigma_D^2 r}{r},$$

where $\bar{\mu}_\tau = \int_i \mu_{i,\tau} di$

Model Equilibrium