Management and Returns

N. Bloom  B. Lucking  S. Ohlmacher  S. Otero  N. Pierri
Stanford University & U.S. Census Bureau

October 26, 2017
Summary of finding

We consider a sample of listed US manufacturing companies

1. Companies with better management z-score **show higher returns after the interview**
   - Many specification show statistically different from zero only on first month, some show effects up to 3/4 months (10% confidence)

2. Not robust effects for the before period
1. **CRSP**: Daily U.S. stock database contains end-of-day and month-end prices on primary security listings
   - Jan/2001-Dec/2016
   - 15,420 unique PERMNO (or CUSIP) and 13,196 unique CUSIP6

2. **WMS**: World Management Survey
   - Analysis at the CUSIP6 level
     - 949 unique CUSIP6 and 1,562 observations (565 firms with \( N=1 \); 212 with \( N=2 \); 125 with \( N=3 \); 38 with \( N=4 \); 8 with \( N=5 \) and 1 with \( N=6 \)).
     - 312 unique CUSIP6 have been public at some point.
   - Variables of Interest: management score measures
Observation is a stock-wave combination for a trading day

- One company can have multiple stock securities (e.g. different rights)
- Some companies have been interviewed across multiple waves, with different z scores

- Total of 264 companies for 440 company-wave pairs
Data

- Independent variable is firm i’s daily CRSP stock return $r_{i,t}$ (including dividends)
  - $t$ is trading day
  - $i = w \times s$ is a the cartesian product of stock×wave

- Dependent variable is $z_{w(i)}$
  - management score of firm $i$ in wave $w$

- For exposition convenience, we just refer to $i$ as a firm (so we just write $z_i$)
Alternatively we use a risk adjusted return

Estimated from the residuals obtained from firm-level regressions on the Fama French 3- and 5-factor asset pricing model

\[
    r_{it}^{\text{excess}} = \alpha_i + \beta_{i,mkt}MKT_t + \beta_{i,hml}HML_t + \beta_{i,smb}SMB_t + \beta_{i,rmw}RMW_t + \beta_{i,cma}CMA_t + \varepsilon_{it}
\]

- \(r_{it}^{\text{excess}}\): daily CRSP stock return (including dividends) in excess of the t-bill rate
- MKT: CRSP value-weighted index in excess of the risk free rate
- SMB: size factor
- HML: book to market factor
- RMW: operating profitability factor
- CMA: investment factor
Let \( \tau \) be the day of interview and \( \delta = 0, 30, 60, \ldots, 365 \) be a time span in days. For each company \( i \), trading day \( t = \tau + \delta \) we run

\[
r_{i,t,\tau} = \alpha \delta z_{i,t} + \gamma X_{i,t,\tau} + \eta_{i,t,\tau}
\]

where:

- \( r_{i,t,\tau} \) is the daily stock return of company \( i \) in trading day \( t \)
- \( z_{i,\tau} \) is the z-management score that firm \( i \) received in interview at day \( \tau \)
- \( X_{i,t,\tau} \) is a set of controls

- The \( \alpha \)'s are the coefficients of interest
Empirics

- Which controls do we include?

\[ r_{i,t,\tau} = \alpha \delta z_{i,t,\tau} + \gamma X_{i,t,\tau} + \eta_{i,t,\tau} \]

- All the regressions include
  - Wave and country FEs
  - lagged measure of size (employment and sales)
  - controls for risk-free rate and mkt return (use quintile to be more flexible)

- Then, we add specifications with
  - FEs for trading day and day of interview

- Daily returns are winsorized at 0.5% (0.25% on each side) in most specification
Histogram of Daily Returns

- Include trading days 30 days before and after interviews

**Figure:** Histograms of Returns

(a) Trimming  
(b) Winsorizing
Returns

(c) Main

(d) Risk Adjusted
Dynamics: Model

- We describe the process how management evolves, second the information structure and third we characterize stock prices.

Environment
- Stock markets are spot markets and that information is symmetric across agents → stocks are paid their expected value every period.
- No inter-temporal discount rate.
- Traders do not observe management but instead receive noisy signals.
- Agents know the structure of the economy and update expectations in a Bayesian manner.

- The market consists of “n” firms with heterogeneous valuations.
  \[ V_i = \lambda M_{it}, \text{ where} \]
  - \( \lambda \) is a scaling parameter that we normalize to 1.
  - \( M_t \) is the management level of company \( i \) in period \( t \).
Dynamics: Model

Define \( m_{it} = \log M_{it} \) and impose a specific management process:

\[
m_{it} = \rho m_{it-1} + \sigma m \varepsilon_{it}
\]

- \( \rho \in (0, 1] \): persistence of the autoregressive process
- \( \varepsilon_{it} \sim N(0, 1) \): persistent innovations to management
- \( m_{i0} = 0 \) initializes the difference equation

Signals

- The market observes one binary i.i.d. signal \( s_{it} \) of the asset quality on each of the periods
- The researcher has insider information in form of a binary signal \( z_i \) in period \( t = \tau \)
- This signal is uncorrelated to the market signal
Dynamics: Model

- The information structure consists of:
  \[ s_{it} = m_{it} + \sigma_{s} \nu_{it} \]
  \[ z_{i\tau} = m_{i\tau} + \sigma_{z} \eta_{i\tau} \]

- \( I^t \) is the information set available to the market at time \( t \) (i.e. all signals observed in periods \( 0 \) through \( t \))
  - Fully characterized by the matrix of signals \( z^t_i = \{z_{t-k_i}, \ldots, z_{it}\}' \)
  - \( k \) is the number of lags containing the relevant information
  - As reflection of bounded rationality
Dynamics: Model

- Firms are owned by 1 shareholder (i.e., a firm is a stock)

- The price of the company is defined as

\[ P_{it} = \mathbb{E}[V_i | \mathcal{I}^t] = \mathbb{E}[\exp m_{it} | \mathcal{I}^t] \]

- We derive the structural equation of prices on observed signals as:

\[ P_{it} = \mathbb{E}[\exp m_{it} | \mathcal{I}^t] = \mathbb{E}[\exp m_{it} | \mathcal{Z}^t_i] \approx \text{BLP}(\exp m_{it} | \mathcal{Z}^t_i) \equiv \gamma + \mathcal{Z}^t_i \beta \]
Dynamics: Simulation

1. Parameters:
   - Management: $\Theta_m = \{\rho, \sigma_m\}$
   - Market Signal: $\Theta_s = \{\sigma_s\}$
   - Researcher Signal: $\Theta_z = \{\sigma_z, \tau\}$

2. Training Model
   2.1 Set number of firms $n_o$, periods $T_o$, burned periods $B$, and market signal lags $k$
   2.1 Simulate $W_o = \{m_{it}, s_{it}\mid \Theta_m, \Theta_s\}$
   2.3 Stack the data from periods $t = B + 1$ to $T$
      - $Y_o$: vector of stacked management values
      - $X_o$: vector of stacked market signals, including $k$ lags for every period
   2.4 Estimate $\Psi = \{\gamma, \beta\}$ from an OLS of $Y_o$ on $X_o$ and a constant
3. Estimation

3.1 Set number of firms $n_1$, periods $T_1$
3.2 Simulate $W_1 = \{m_{it}, s_{it}, z_t | \Theta_m, \Theta_s, \Theta_z \}$
3.3 Use $\hat{\Psi}$ to estimate prices for periods $t = k + 1$ to $T_1$
3.4 Construct the returns for each firm and period $r_{it}$ and winsorize at 5% (2.5% on each side)
3.5 Stack the data from periods $t = k + 1$ to $T$
   ▶ $Y_1$: vector of stacked returns $r_{it}$
   ▶ $X_1$: vector of stacked researcher signal, including $k$ lags for every period
3.6 Estimate $r_{it} = \delta^j + \phi^j z_{it}$ using $j \in \{1 : T - \tau \}$ periods after $\tau$
3.7 Estimate $r_{it} = \delta^j + \phi^j z_{it}$ using $j \in \{1 : \tau - k \}$ periods before $\tau$
3.8 Repeat steps 3.1 to 3.7 $p$ times. Calculate the median and average coefficient
3.9 Plot the $T - k$ median and average coefficients
Dynamics: Baseline Parameters

▶ Parameters:
  ▶ Management: \( \Theta_m = \{ \rho = 0.8, \sigma_m = 1 \} \)
  ▶ Market Signal: \( \Theta_s = \{ \sigma_s = 1 \} \)
  ▶ Researcher Signal: \( \Theta_z = \{ \sigma_z = 1, \tau = 400 \} \)

▶ Training Economy:
  ▶ \( T_0 = 5,000, n_0 = 1,000, B = 0.2T_0, k = 100 \)

▶ Estimating Economy:
  ▶ \( T_1 = 600, n_1 = 300, k = 100 \)
Dynamics: Plots

(a) Baseline
Dynamics: Plots

- $k$: Number of lags account in price $\rightarrow$ Not relevant

(b) $k = 10$

(c) $k = 100$
Dynamics: Plots

- $\rho$: management process correlation

(d) $\rho = 0.3$

(e) $\rho = 0.8$
Dynamics: Plots

- \( \rho \): management process correlation

(f) \( \rho = 0.5 \)

(g) \( \rho = 0.8 \)
Dynamics: Plots

- $\rho$: management process correlation

(h) $\rho = 0.9$

(i) $\rho = 0.8$
Dynamics: Plots

- $\sigma_m$: management process noise

(j) $\sigma_m = 2$

(k) $\sigma_m = 1$
Dynamics: Plots

- $\sigma_s$: market signal noise

(l) $\sigma_s = 2$

(m) $\sigma_s = 1$
Dynamics: Plots

- $\sigma_z$: insider signal noise

(n) $\sigma_z = 2$

(o) $\sigma_z = 1$