Labor Adjustment Cost: Implications from Asset Prices *

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Latest Versions of Paper, Slides, and Online Appendix

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Labor Adjustment Cost: Implications from Asset Prices

What is a firm's labor input? &
How does it affect the firm's outcomes, aggregate economy, and equity market?

- **Firm's Outcome** A firm makes labor input decisions along hours and employment (hours: hours per worker; employment: number of workers), which further influence the firm's real quantities and asset prices
- **Aggregate Economy** The labor input decisions among firms contains information about the state of and the changes in the aggregate economy, i.e., business cycle fluctuations
- **Equity Market** The cross-sectional equity return pattern reveals whether and how the labor input channels the interplay between real economy and financial market

This paper puts an innovative focus on hours

Propose an empirical fact relating the hours margin of a firm's labor input and its future equity return
W/ equilibrium model + structural estimation, argue it matters for macroeconomics and asset pricing

What I Do: Main Results (1 of 2)

Data & Measurement Measure the hours margin of labor input at the firm level

- 3 datasets: CRSP/Compustat Merged + BLS/Occupational Employment Statistics + BLS/ Current Population Survey
- A battery of robustness examinations, e.g., 71% all public firms, time-varying occupation composition, etc.

Empirical Evidence High hours growth predicts low future equity returns

- Firm: 1 percent increase in hours $\sim$ .60 percent decrease in equity return (employment: .11; capital: .09)
- Firm: 1 std-dev increase in hours $\sim$ 2.4 percent decrease in equity return (employment: 2.3; capital: 2.5)

- Portfolio: quintile portfolios sorted by hours growth $\sim$ 7 percent annual LMH (CAPM: 6; SMB: 3; HML: 1)
- Portfolio: cannot be explained by CAPM/Fama-French/investment-q models $\sim$ a new anomaly and factor

Equilibrium Model Labor Adjustment Cost + Adjustment Cost Shock

- Labor adjustment cost is explicit along firm's labor input decisions of hours and employment
- Adjustment cost shock is an aggregate source of macro risk, lowering adjustment cost in the economy

What I Do: Main Results (2 of 2)

Economic Mechanism Firms who adjust hours more pay out more consumption when aggregate consumption is low

Micro Force: Firms who adjust hours more take advantage of adjustment cost shock and pay out more consumption
Macro Force: Adjustment cost shock incentivizes aggregate investment, crowding out aggregate consumption

Structural Estimation Standard Calibration + Simulated Method of Moments

Real: Firm-level moments of and pooled distribution stats of hours and employment growth
Equity Return: Firm-level equity return predictability of hours and employment growth

Implications Identification of Systematic Risk/Macro Shock + Determinant of a Firm's Real Quantity/Asset Price

Aggregate: Negative price of risk (Fama-French: ME-BM 25 & Industry 17 Portfolios)
Aggregate: Positive immediate spikes in investment and negative hump-shaped decrease in consumption

Firm: High hours growth $\sim$ high loading of adjustment cost shock $\sim$ high cash flow
Firm: High hours growth $\sim$ high loading of adjustment cost shock $\sim$ low equity return

Why Should You Care: Contributions

Measure of hours margin of labor input at the micro-level

First attempt and related to a variety of key economic issues (e.g., productivity, misallocation, labor share, etc.)

Dynamics between two margins of labor input at the micro-level

Microstructure of a firm's labor input decision-making process (the "real" side of the story)

Relationship between labor input and equity return

A novel set of empirical results

$\Rightarrow$ an aggregate source of macro shock/a systematic risk from equity market

$\Rightarrow$ an economic force linking production fundamentals (labor input) to outcomes

Modeling-Estimation-Discussion of labor adjustment cost

Rich specifications of labor adjustment cost structure

$\Rightarrow$ Quantifiable framework to discuss labor adjustment friction (20% $\sim$ hours; 90% $\sim$ non-convex)

$\Rightarrow$ Useful policy evaluation tool (e.g., during 07-09, unempt-rate US $\uparrow$ whereas Germany $\downarrow$ w/ "Short-Time Work")

Selected Strands of Literature

Dynamic factor demand with adjustment cost Yashiv [2000], Hall [2004], Merz & Yashiv [2007] (no hours margin); Bloom [2009], Cooper & Willis [2009], Cooper et al. [2015] (frictionless hours margin)

Hours responds to macro shock, adjustment cost shock, substantially via adjustment cost

Labor market frictions and the cross-section of equity returns Eisfeldt & Papanikolaou [2013] (organization); Donangelo [2014] (mobility); Belo et al. [2014, 2017] (skill + hiring); Zhang [2019] (automation); Bretscher [2019] (offshore)

Labor adjustment cost along hours margin reveals cross-sectional equity return new pattern

Production approach to asset pricing Cochrane [1991, 1996], Jermann [1998], Belo [2010], Zhang [2005]; Greenwood et al. [1997, 2000], Papanikolaou [2011], Kogan & Papanikolaou [2013, 2014]

Connect fundamental production input, hours, to firms' future cash flows and equity returns

International (OECD) empirical evidence about aggregate hours and employment Ohanian et al. [2008], Ohanian & Raffo [2012], Llosa et al. [2014]

Propose a micro-level measure of hours while matching hours and employment empirical regularities

Selected Details of Results

Empirical Evidence Firm- & Portfolio-level: High Hours Growth Predicts Low Future Equity Returns

Equilibrium Model Two Key Ingredient: Labor Adjustment Cost + Adjustment Cost Shock

Structural Estimation Fairly Good Fit: Firm-level Moments + Pooled Distribution Stats

Model Assessment Two Set Empirical Regularities: Equity Return Predictability & Adjustment Cost Magnitudes

Model Implications Aggregate- & Firm-level: Macro Shock + Systematic Risk & Cash Flow + Equity Return

Empirical Firm-level Evidence: High Hours Growth Predicts Low Future Equity Returns

Firm-level equity return predictability regression: $R_{j,t+1} = a_0 + a_j + a_{t+1} + b_H \times G_{jt}^H + b_N \times G_{jt}^N + b_K \times G_{jt}^K + \boldsymbol{bF}_{jt} + e_{j,t+1}$

where $R_{j,t+1}$ is firm j's equity return from July of year $t+1$ to June of year $t+2$, and G_{jt}^H is firm j's hours growth, G_{jt}^N is firm j's employment growth, and G_{jt}^K is firm j's investment ratio (investment-to-capital) from January to December of year t.

	[1]	[2]	[3]	[4]	[5]	[6]
Regression Method	OLS	OLS	OLS	OLS	OLS	OLS
Dependent Variable	$R_{j,t+1}$	$R_{j,t+1}$	$R_{j,t+1}$	$R_{j,t+1}$	$R_{j,t+1}$	$R_{j,t+1}$
b_H: Hours Growth G_{jt}^H	-62.86^{***}		-61.11^{***}	-60.23^{***}	-54.00^{***}	-54.03^{***}
	(14.74)		(14.71)	(14.67)	(13.35)	(12.57)
b_N: Employment Growth G_{jt}^N		-13.93^{***}	-14.96^{***}	-11.23^{***}	1.52	-10.28^{***}
		(1.43)	(2.15)	(2.24)	(2.13)	(1.48)
Investment Ratio	No	No	No	Yes	No	No
Pricing Factors	No	No	No	No	Yes	No
Fixed Effects	Firm,Year	Firm,Year	Firm,Year	Firm,Year	Firm,Year	Year
Observations	23,030	42,063	23,030	23,030	23,029	23,030
Firms	4,473	5,824	4,473	4,473	4,473	4,473
Years	$1998-2017$	$1998-2017$	$1998-2017$	$1998-2017$	$1998-2017$	$1998-2017$

Firm-Level Equity Return Predictability Regressions Results. This table tabulates the baseline results of firm-level equity return predictability regressions in the form indicated. On the left-hand side, $R_{j,t+1}$ is the firm j's future annual equity return. On the right-hand side, a_0, a_j, a_{t+1} are respectively the constant, the firm fixed effects, and the year fixed effects. The key variables on the right-hand side are the firm j's current annual hours growth G_{jt}^H and employment growth G_{jt}^N. Additionally on the right-hand side, G_{jt}^K is firm j's current investment ratio; $\boldsymbol{F}_{jt}$ is a vector of five pricing factors measured at the firm-level, namely, the market capitalization (size) and book-to-market ratio, the investment-to-assets and return-on-equity, and the profitability. Each column runs one firm-level equity return predictability regression, with *, **, and *** denoting 10%, 5%, and 1% significance levels, and standard errors in parenthesis. I implement all regressions using panel OLS with firm standard error clusters; the sample spans years from 1998 to 2017 annually.

Empirical Portfolio-level Evidence: High Hours Growth Predicts Low Future Equity Returns

Portfolio-level factor mimicking approach: univariate quintile (5) portfolios with three measures of equity return

	Value-Weighted						Equal-Weighted						Microcaps-Excl. Equal-Weighted					
	L	2	3	4	H	L-H	L	2	3	4	H	L-H	L	2	3	4	H	L-H
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]
Panel A	Portfolio Excess Return Summary Statistics																	
Mean $\mu(r^e_{t+1})$	0.10	0.07	0.06	0.05	0.03	0.07	0.14	0.14	0.12	0.06	0.07	0.07	0.12	0.11	0.09	0.04	0.05	0.07
Std Dev $\sigma(r^e_{t+1})$	0.17	0.19	0.20	0.18	0.22	0.14	0.22	0.26	0.29	0.31	0.25	0.15	0.17	0.18	0.24	0.26	0.25	0.19
Sharpe ratio	0.53	0.34	0.27	0.24	0.13	0.44	0.62	0.52	0.42	0.18	0.28	0.39	0.69	0.61	0.36	0.14	0.21	0.32

Portfolio-Level Main Results This table tabulates the main results of the portfolio-level analyses using the univariate quintile portfolios sorted by the cross-sectional hours growth. Reading horizontally, the columns [1] to [6] use value-weighted, the columns [7] to [12] use equal-weighted, and the columns [13] to [18] use equal-weighted, microcaps excluded portfolio equity returns, where the microcaps are the firms with a market capitalization that is below the NYSE 20-percentile threshold in each cross-section (Hou et al. [2018]). Of each weighting scheme, from left to right, the first five columns are quintile portfolios respectively, and the last column is the quintile portfolio spread, defined as low-minus-high (L-H). Reading vertically, panel A provides portfolio equity excess return summary statistics, including the mean of portfolio equity excess returns $\mu(r^e_{t+1}) = \mu(r_{t+1}) - \mu(r_{f,t+1})$, the standard deviation of portfolio equity excess returns $\sigma(r^e_{t+1})$, and portfolio Sharpe ratio. Next, panels B to D present portfolio excess equity return anomalies implied by asset pricing models. Specifically, panel B employs the capital asset pricing model (Sharpe [1964]; Lintner [1965]; Black [1972]), panel C the Fama-French 3-factor model (Fama & French [1992, 1993]), and panel D the Fama-French 5-factor model (Fama & French [2015]). Of each the three panels, the row-block (1) reports the model implied anomaly, defined as the intercept a, and its t-statistic; the row-block (2) shows regression summary statistics, including the mean absolute errors (m.a.e.), the ratio of RMSE (root of mean squared errors) and RMSR (root of mean squared returns) from Lettau et al. [2019], the adjusted R^2, and the p value from regression F-test. The sample spans years from 1997 to 2017 annually.

Equilibrium Model Two Key Ingredient: Labor Adjustment Cost + Adjustment Cost Shock

Adjustment cost components and function

$$\begin{aligned}
\text{Adjustment Cost on Hours:} \quad C_{jt}^{H} &= c_d^{H} \times Y_{jt} \times \mathbf{1}_{G_{jt}^{H} \neq 0} + c_i^{H} \times W_{jt} \times |G_{jt}^{H}| + c_q^{H} \times H_{j,t-1} \times (G_{jt}^{H})^2 \\
\text{Adjustment Cost on Employment:} \quad C_{jt}^{N} &= c_d^{N} \times Y_{jt} \times \mathbf{1}_{G_{jt}^{N} \neq 0} + c_i^{N} \times W_{jt} \times |G_{jt}^{N}| + c_q^{N} \times N_{j,t-1} \times (G_{jt}^{N})^2
\end{aligned}$$

where

Y is output, W is Wage, H is hours, N is employment, C is adjustment cost.

c_d represents non-convex disruption cost, c_i linear irreversibility cost, and c_q convex quadratic cost, and such 2-by-3 structure poses estimation difficulties, due to discontinuity and non-linearity.

Adjustment cost wedge and shock

$$C_{jt} = \frac{C_{jt}^{H} + C_{jt}^{N}}{X_t}$$

where

adjustment cost wedge is $\log(X_t) = \rho_X \log(X_{t-1}) + \sigma_X \epsilon_t^X$ and adjustment cost shock is $\epsilon_t^X \sim \mathcal{N}(0,1)$, and an aggregate shock lowers adjustment cost and benefits firms who adjust.

Fairly Good Structural Estimation: Firm-level Moments

	Moments		Values	
	Description	Definition	Data	Baseline
	[1]	[2]	[3]	[4]
Panel A	Firm-Level			
Panel A.1	Targeted			
	Kurtosis of hours growth	$kurt(G^H)^{1/4}$	1.927	1.818
	Kurtosis of emp't growth	$kurt(G^N)^{1/4}$	1.668	1.495
	Persistence of hours growth	$rho(G^H)$	-0.376	-0.227
	Persistence of emp't growth	$rho(G^N)$	-0.005	-0.110
	Same-period correlation coeff.	$corr(G^H, G^N)$	0.029	0.000
	Cross-period correlation coeff.	$corr(G^H, G^N_{-1})$	-0.024	-0.026
Panel A.2	Non-Targeted			
	Cross-period correlation coeff.	$corr(G^H_{-1}, G^N)$	0.012	0.032
	Mean of hours growth	$mean(G^H)$	0.001	0.001
	Mean of emp't growth	$mean(G^N)$	0.051	0.003
	Variance of hours growth	$var(G^H)^{1/2}$	0.032	0.032
	Variance of emp't growth	$var(G^N)^{1/2}$	0.210	0.095
	Skewness of hours growth	$skew(G^H)^{1/3}$	0.538	0.556
	Skewness of emp't growth	$skew(G^N)^{1/3}$	0.719	0.702

Firm-Level Moments and Pooled Distributions of Hours and Employment Growth This table summarizes the moments matching in data, baseline model, and counterfactual analysis. In presenting the moments, I report firstly the firm-level moments in panel A and secondly the pooled distribution moments in panel B. In panel A, the subpanel A.1 lists the six targeted and the subpanel A.2 the seven non-targeted; in panel B, the subpanel B.1 tabulates pooled distribution statistics for the hours growth and the subpanel B.2 those for the employment gorwths. Across columns, the moments are described in columns [1] and [2]. The values of the moments are tabulated in columns [3] to [4]. Specifically, the column [3] lists the value from the data, and the column [4] from the baseline model. In calculating the data values in column [3], I compute using bootstrapping. For the model values in column [4], I compute using simulated 2675 firms across 300 years. In defining the inaction, the maintenance, and the spike rates of the pooled distributions, I use the cutoff values from Cooper & Haltiwanger [2006] and Cooper et al. [2007] with updates to match the frequency of my data.

Fairly Good Structural Estimation: Pooled Distribution Stats

	Moments		Values	
	Description	Definition	Data	Baseline
	[1]	[2]	[3]	[4]
Panel B	Pooled Distributions (Non-Targeted)			
Panel B.1	Hours Growth			
	Negative spike rate (%)	$G^H \in (-\infty, -0.2]$	0.00	0.00
	Negative maintenance rate (%)	$G^H \in (-0.2, -0.1]$	1.40	3.07
	Inaction rate (%)	$G^H \in (-0.1, +0.1)$	96.81	93.61
	Positive maintenance rate (%)	$G^H \in [+0.1, +0.2)$	1.79	3.32
	Positive spike rate (%)	$G^H \in [+0.2, +\infty)$	0.00	0.00
Panel B.2	Employment Growth			
	Negative spike rate (%)	$G^N \in (-\infty, -0.2]$	9.04	2.03
	Negative maintenance rate (%)	$G^N \in (-0.2, -0.1]$	12.09	13.52
	Inaction rate (%)	$G^N \in (-0.1, +0.1)$	58.60	69.03
	Positive maintenance rate (%)	$G^N \in [+0.1, +0.2)$	10.13	13.16
	Positive spike rate (%)	$G^N \in [+0.2, +\infty)$	10.14	2.26

Firm-Level Moments and Pooled Distributions of Hours and Employment Growth This table summarizes the moments matching in data, baseline model, and counterfactual analysis. In presenting the moments, I report firstly the firm-level moments in panel A and secondly the pooled distribution moments in panel B. In panel A, the subpanel A.1 lists the six targeted and the subpanel A.2 the seven non-targeted; in panel B, the subpanel B.1 tabulates pooled distribution statistics for the hours growth and the subpanel B.2 those for the employment gorwths. Across columns, the moments are described in columns [1] and [2]. The values of the moments are tabulated in columns [3] to [4]. Specifically, the column [3] lists the value from the data, and the column [4] from the baseline model. In calculating the data values in column [3], I compute using bootstrapping. For the model values in column [4], I compute using simulated 2675 firms across 300 years. In defining the inaction, the maintenance, and the spike rates of the pooled distributions, I use the cutoff values from Cooper & Haltiwanger [2006] and Cooper et al. [2007] with updates to match the frequency of my data.

Model Assessment Based On Empirical Regularities: Equity Return Predictability

Firm-level equity return predictability regression: $R_{j,t+1} = a_0 + a_j + a_{t+1} + b_H \times G_{jt}^H + b_N \times G_{jt}^N + b_K \times G_{jt}^K + \boldsymbol{bF}_{jt} + e_{j,t+1}$

where $R_{j,t+1}$ is firm j's equity return from July of year $t+1$ to June of year $t+2$, and G_{jt}^H is firm j's hours growth, G_{jt}^N is firm j's employment growth, and G_{jt}^K is firm j's investment ratio (investment-to-capital) from January to December of year t.

	[1]	[2]	[3]	[4]	[5]	[6]
	Data			Model		
Regression Method	OLS	OLS	OLS	OLS	OLS	OLS
Dependent Variable	$R_{j,t+1}$	$R_{j,t+1}$	$R_{j,t+1}$	$R_{j,t+1}$	$R_{j,t+1}$	$R_{j,t+1}$
b_H: Hours Growth G_{jt}^H	-62.86^{***}		-61.11^{***}	-47.45^{***}		-47.46^{***}
	(14.74)		(14.71)	(0.95)		(0.95)
b_N: Employment Growth G_{jt}^N		-13.93^{***}	-14.96^{***}		-14.82^{***}	-14.83^{***}
		(1.43)	(2.15)		(0.38)	(0.38)
Fixed Effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Observations	23,030	42,063	23,030	371,825	371,825	371,825
Firms	4,473	5,824	4,473	2,675	2,675	2,675
Years	$1998-2017$	$1998-2017$	$1998-2017$	$t: 151-300$	$t: 151-300$	$t: 151-300$

Assess the Equity Return Predictability in the Model This table compares the firm-level equity return predictability regressions in the data and in the model. On the left-hand side, $R_{j,t+1}$ is the firm j's future annual equity return. On the right-hand side, a_0, a_j, a_{t+1} are respectively the constant, the firm fixed effects, and the year fixed effects. The key variables on the right-hand side are the firm j's current annual hours growth G_{jt}^H and employment growth G_{jt}^N. Each column runs one firm-level equity return predictability regression, with *, **, and *** denoting 10%, 5%, and 1% significance levels, and standard errors in parenthesis. I implement all regressions using panel OLS with firm standard error clusters. In examining the equity return predictability of hours growth in the data, I use the sample spanning years from 1998 to 2017 annually. In calculating model-implied predictability of hours growth on equity return , I use simulated data with 2675 firms, to match the average number of firms within one year in data (2675.48), across 300 years, where the first half is dropped to mitigate the influence from initial conditions.

Model Assessment Based On Empirical Regularities: Adjustment Cost Magnitudes

The (untargeted) pooled distributions of hours and employment growth are informative about adjustment cost magnitudes.

- Across components, non-convex disruption is the driving force of labor adjustment cost.
- Across margins, significant portion of labor adjustment cost occurs along the hours margin.

	Employment	Hours	
Non-convex disruption	70.71	19.47	90.18
Linear irreversibility	7.42	1.61	9.03
Convex quadratic	0.28	0.50	0.79
	78.42	21.58	100.00

Implied Magnitudes of Labor Adjustment Cost This table reports the magnitudes of labor adjustment cost implied by estimation of the baseline model. Reading across columns, the labor adjustment cost occurs along both margins of hours and employment; reading across rows, there are three adjustment cost components considered, namely, the non-convex disruption, the linear irreversibility, and the convex quadratic. To compare the magnitudes, I calculate the relative size of labor adjustment cost in form of each component along either margin as a faction of total labor adjustment cost.

Model Aggregate-Level Implication: Counter-Cyclical Macro Shock in Business Cycles

Aggregate dynamic response regressions: $\frac{1}{s+1}[\log(\Gamma_{t+s}) - \log(\Gamma_{t-1})] = a_s + \beta^{ACS} F_t^{\mathsf{ACS}} + \beta^{\mathsf{MKT}} F_t^{\mathsf{MKT}} + e_{ts}; s = 0, \cdots, S.$

where $F_t^{\mathsf{ACS,MKT}}$ are empirical proxies of macroeconomic shocks (normalized), and $\beta^{ACS,MKT}$ measures impact on growth rate of output, consumption, or investment from a one-standard deviation increase.

Future S-Year Horizon	s=0	s=1	s=2	s=3	s=4
Dependent Variable	Output	Output	Output	Output	Output
β^{ACS}: Adj Cost Shock F_t^{ACS}	0.57	0.07	-0.24	-0.14	0.11
	(0.45)	(0.37)	(0.33)	(0.24)	(0.26)
Dependent Variable	Consumption	Consumption	Consumption	Consumption	Consumption
β^{ACS}: Adj Cost Shock F_t^{ACS}	-0.60^{**}	-0.77^{***}	-0.76^{***}	-0.50^{***}	-0.19
	(0.26)	(0.20)	(0.15)	(0.13)	(0.21)
Dependent Variable	Investment	Investment	Investment	Investment	Investment
β^{ACS}: Adj Cost Shock F_t^{ACS}	2.66^{*}	1.57^{*}	0.06	-0.42	-0.06
	(1.32)	(0.78)	(0.66)	(0.48)	(0.46)
Observations	19	18	17	16	15
Years	$1998-2017$	$1998-2017$	$1998-2017$	$1998-2017$	$1998-2017$

Aggregate Dynamic Response Regressions Results This table tabulates the results of aggregate dynamic response regressions in the form of ??. On the left-hand side, Γ_t denotes the aggregate output, consumption, or investment. Thus the left-hand side measures the annualized S-year horizon growth rate. To better interpret the coefficient $\beta^{ACS,MKT}$, I normalize the factors $F_t^{\mathbf{ACS,MKT}}$ to zero mean and unit standard deviation. Each column runs one aggregate dynamic response regression, with *, **, and *** denoting 10%, 5%, and 1% significance levels, and standard errors in parenthesis. I implement all regressions using OLS with standard errors corrected for heteroscedasticity and serial correlation (Newey & West [1987]). Following Papanikolaou [2011], I define the aggregate output as the real gross domestic product excluding real government consumption expenditures and gross investment, the aggregate consumption as real personal consumption expenditures on nondurable goods and services, and the aggregate investment as real private nonresidential fixed investment. The sample spans years from 1998 to 2017 annually.

Model Aggregate-Level Implication: Negative-Priced Systematic Risk from Equity Market

Fama-MacBeth regressions: $\mathbb{E}[R_{\iota,t+1} - R_{f,t+1}] = \lambda^{\mathsf{MKT}}\beta_\iota^{\mathsf{MKT}} + \lambda^{\mathsf{ACS}}\beta_\iota^{\mathsf{ACS}}; \iota = 1, \cdots, \mathcal{I}$.

where $\beta_\iota^{\mathsf{MKT,ACS}}$ are the portfolio ι's risk loadings of market and adjustment cost shock factors, respectively; the $\lambda^{\mathsf{MKT,ACS}}$ are the estimated risk prices for market and adjustment cost shock factors implied by the testing portfolio set $\mathcal{I}$.

	[1]	[2]	[3]	[4]
Regression Method	Fama-MacBeth	Fama-MacBeth	Fama-MacBeth	Fama-MacBeth
Testing Portfolios	ME-BM Sorted	ME-BM Sorted	Industry	Industry
Risk Price λ^{MKT} of Market Factor F_t^{MKT}	0.85^{***}	0.39^{**}	1.38^{**}	0.44^{***}
	(0.21)	(0.15)	(0.53)	(0.13)
Risk Price λ^{ACS} of Adj Cost Shock Factor F_t^{ACS}		-0.31^{***}		-0.28^{***}
		(0.10)		(0.09)
Standard Errors	Newey-West	Newey-West	Newey-West	Newey-West
Observations	500	500	340	340
Portfolios	25	25	17	17
Years	$1998-2017$	$1998-2017$	$1998-2017$	$1998-2017$

Asset Pricing Tests of Adjustment Cost Shock Risk Price This table reports the asset pricing test results of adjustment cost shock risk price. To calculate risk prices, I use two sets of testing portfolios, the Fama-French 25 portfolios size (ME) and book-to-market (BM) sorted and Fama-French 17 industry portfolios. Each column runs one asset pricing test regression, with *, **, and *** denoting 10%, 5%, and 1% significance levels, and standard errors in parenthesis. I implement all regressions using Fama-Macbeth method (Fama & MacBeth [1973]) with standard errors corrected for heteroscedasticity and serial correlation (Newey & West [1987]). The sample spans years from 1998 to 2017 annually.

Model Firm-Level Implication: High Growth, Large Loading, and High Cash Flow

Firm-level cash flow response regressions: $\Pi_{j,t} = b^{(1)} \times F_t^{\text{ACS}} + \sum_{p=2}^{P=3} b^{(p)} \times D_{jt}^{(p)} \times F_t^{\text{ACS}} + c^{(1)} + \sum_{p=2}^{P=3} c^{(p)} \times D_{jt}^{(p)} + d \times \Pi_{j,t-1} + e_{j,t}$.

where F_t^{ACS} is the adjustment cost shock, $D_{jt}^{(p)}$ is tertile portfolio dummy, and $b^{(p)}$ measures the different responses of cash flow to a positive adjustment cost shock via adjusting hours.

	[1]	[2]	[3]	[4]	[5]	[6]
Dependent Variable at t	Payout Intensity		Payout Log-Level		Payout Growth	
Control Variable at $t-1$	No	Yes	No	Yes	No	Yes
$b^{(1)}$: F_t^{ACS}	-0.10^{***}	-0.07^{***}	-0.23^{***}	-0.24^{***}	-0.54^{***}	-0.26^{***}
	(0.01)	(0.01)	(0.07)	(0.06)	(0.09)	(0.07)
$b^{(2)}$: $F_t^{\text{ACS}} \times D_{jt}^{(2)}$	0.10^{***}	0.06^{***}	0.20^{**}	0.26^{***}	0.42^{***}	0.18^{**}
	(0.02)	(0.02)	(0.09)	(0.08)	(0.12)	(0.09)
$b^{(3)}$: $F_t^{\text{ACS}} \times D_{jt}^{(3)}$	0.15^{***}	0.09^{***}	0.63^{***}	0.60^{***}	0.83^{***}	0.66^{***}
	(0.02)	(0.02)	(0.13)	(0.12)	(0.16)	(0.12)
Observations	24,640	24,592	18,601	17,293	17,293	15,198
Firms	4,508	4,493	3,573	3,343	3,343	3,032
Years	1998 – 2017	1998 – 2017	1998 – 2017	1998 – 2017	1998 – 2017	1998 – 2017

Firm-Level Cash Flow Response Regressions This table tabulates the results of firm-level payout response regressions in the form of ??. On the left-hand side, $\Pi_{j,t}$ is firm j's annual payout measured from January of year t to December of year t. On the right hand side, F_t^{ACS} is the aggregate adjustment cost shock, measured as the portfolio equity return spread from July of year t to June of year $t+1$. $D_{jt}^{(p)}$ is firm j's portfolio assignment at the end of year t; for example, $D_{jt}^2 == 1$ indicates firms in the second portfolio univariate sorted by cross-sectional hours growth. Additionally on the right-hand site, $\Pi_{j,t}$ is firm j's annual payout measured from January of year $t-1$ to December of year $t-1$. Each column runs one firm-level payout response regression, with *, **, and *** denoting 10%, 5%, and 1% significance levels, and standard errors in parenthesis. I measure payout as the payout intensity (ratio of cash flow to total assets) on columns [1] and [2], as the payout log-level in columns [3] and [4], and payout growth in columns [5] and [6]. For each measurement, I estimate the responses with and without the payout control. I implement all regressions using OLS. The sample spans years from 1998 to 2017 annually.

Model Firm-Level Implication: High Growth, Large Loading, and Low Equity Return

Firm-level equity return response regressions:

$$R_{j,t+1} = b^{(1)} \times F_t^{\text{ACS}} + \sum_{p=2}^{P=3} b^{(p)} \times D_{jt}^{(p)} \times F_t^{\text{ACS}} + c^{(1)} + \sum_{p=2}^{P=3} c^{(p)} \times D_{jt}^{(p)} + d \times \Phi_{j,t} + e_{j,t+1}.$$

where F_t^{ACS} is the adjustment cost shock, $D_{jt}^{(p)}$ is tertile portfolio dummy, and $b^{(p)}$ measures the different responses of equity return to a positive adjustment cost shock via adjusting hours.

	[1]	[2]	[3]	[4]	[5]	[6]
Dependent Variable at $t+1$	Euqity Return					
Control Variable at t	No	Equity Return	Payout Intensity	Payout Growth	Payout Log-Level	Output Log-Level
$b^{(1)}$: F_t^{ACS}	0.01	-0.00	0.01	-0.07	-0.02	0.00
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
$b^{(2)}$: $F_t^{\text{ACS}} \times D_{jt}^{(2)}$	-0.25^{***}	-0.22^{***}	-0.26^{***}	-0.21^{***}	-0.25^{***}	-0.24^{***}
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
$b^{(3)}$: $F_t^{\text{ACS}} \times D_{jt}^{(3)}$	-0.45^{***}	-0.42^{***}	-0.45^{***}	-0.34^{***}	-0.33^{***}	-0.46^{***}
	(0.11)	(0.11)	(0.11)	(0.09)	(0.09)	(0.11)
Observations	24,824	24,824	24,602	16,400	18,936	24,824
Firms	4,567	4,567	4,496	3,255	3,635	4,567
Years	$1998-2017$	$1998-2017$	$1998-2017$	$1998-2017$	$1998-2017$	$1998-2017$

Firm-Level Equity Return Response Regressions This table tabulates the results of firm-level equity return response regressions in the form of ??. On the left-hand side, $R_{j,t+1}$ is firm j's annual equity return from July of year $t+1$ to June of year $t+2$. On the right hand side, F_t^{ACS} is the aggregate adjustment cost shock, measured as the portfolio equity return spread from July of year t to June of year $t+1$. $D_{jt}^{(p)}$ is firm j's portfolio assignment at the end of year t; for example, $D_{jt}^2 == 1$ indicates firms in the second portfolio univariate sorted by cross-sectional hours growth. Additionally on the right-hand site, $\Phi_{j,t}$ is some control variable for firm j measured by end of year t. Each column runs one firm-level equity return response regression, with *, **, and *** denoting 10%, 5%, and 1% significance levels, and standard errors in parenthesis. I implement all regressions using OLS. The sample spans years from 1998 to 2017 annually.

Other Working Projects & Future Research Plans

Consumption Behavior Frontier Use micro level data to understand consumption behavior and asset prices deviating from rational believes and expected utility

E.g. heterogeneous believes, distorted believes, different expectation formation mechanism, cognitive limits, etc.

My Work "Consumption of Stockholders and Nonstockholders: New Evidence from the PSID" (with Marianne Baxter)

Firm Dynamics Frontier Apply heterogeneous agent model to understand firm dynamics using sophisticated computational methods w/ a natural connection to asset pricing

E.g. new perspectives of intangibles at the micro-level, including R&D, automation, labor heterogeneity, etc.,

My Work "Labor Adjustment Cost: Implications from Asset Prices" (job market paper)

Machine Learning Approach to Understand Economic Phenomena Utilize artificial intelligence and machine learning tools to answer economic questions

E.g. natural language processing, feature selection & dimension reduction, discriminant analysis & factor analysis

My Work "Political Risk Exposures of Chinese Firms" (web-scrapping data + natural language processing)

Thank You!

Labor Adjustment Cost: Implications from Asset Prices
Dongwei Xu

Latest Versions of Paper, Slides, and Online Appendix

Abstract: Hours growth is negatively related to future equity returns. At the firm-level, a 1 percent increase in hours predicts a 0.6 percent decrease in future equity return. At the portfolio-level, the quintile low-minus-high spread yields a 7-percent annual risk premium. A production-based asset pricing model rationalizes this negative relation with adjustment cost on hours and adjustment cost shock. A positive adjustment cost shock lowers adjustment cost in the economy and redistributes output from consumption to investment. Firms adjusting hours take advantage of the positive adjustment cost shock and pay out more consumption when marginal utility is high. Therefore, these firms are less risky, explaining low equity returns in equilibrium. Structural estimation matches real quantity moments and equity return predictability. Consistent with the model, the adjustment cost shock recovered from the data is an aggregate shock in the business cycles and a systematic risk in the cross-sections, affecting a firm's cash flow and equity return via its hours choice.
JEL classifications: G12, E23, J23, E13
Keywords: Hours; Labor Adjustment Cost; Equity Return; Real Business Cycles

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