Does wage rigidity make firms riskier? Evidence from long-horizon predictability

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Motivation

- If wages are sticky, they create an additional source of risk for a firm's owners
  - Labor leverage is a type of operating leverage, or quasi-fixed cost
- Firms, industries, or time periods associated with especially rigid wages are especially risky
- Consistent with our intuition, we find that:
  - Wage growth forecasts stock returns negatively in aggregate data
  - Wage growth forecasts stock returns negatively in industry data
  - Predictability is stronger in industries with more wage rigidity

Motivation

- In standard models the wage is equal to the marginal product of labor implying same volatility (in logs) and perfect correlation
- In the data wages are smoother than output and imperfectly correlated with output

		$\sigma(GDP)$	$\sigma(Wage)$	$\rho(GDP, Wage)$
HP filtered	1930-2011	3.55	1.13	0.41
HP filtered	1954-2011	1.69	0.86	0.51
Growth	1930-2011	4.66	1.61	0.47
Growth	1954-2011	2.44	1.34	0.54

Literature Review (1)

- Return Predictability: Fama and Schwert (1973), Fama (1981), Keim and Stambaugh (1986), Campbell and Shiller (1988), Fama and French (1988), Fama and French (1989), Cochrane (1991), Hodrick (1992), Lettau and Ludvigson (2001), Santos and Veronesi (2006)
- Wage Rigidity in Macro: Pissarides (1979), Calvo (1982), Taylor (1983), Mortensen and Pissarides (1994), Taylor (1999), Shimer (2005), Hall (2006), Gertler and Triagari (2009)
- Wage Rigidity in Finance: Danthine and Donaldson (2002), Gourio (2007), Favilukis and Lin (2012), Kuehn, Petrosky-Nadeau, and Zhang (2012)

Literature Review (2)

- Unions and Firm Behavior: Bronars and Deere (1991), DeAngelo and DeAngel (1991), Dasgupta and Sengupta (1993), Cavanaugh and Garen (1997) Rosett (2003), Matsa (2010), Agrawal and Matsa (2011), Chen, Kacperczyk, and Ortiz-Molina (2012), Schmalz (2012)
- Unions and Firm Value: Ruback and Zimmerman (1984), Bronars and Deere (1994), Abowd (1989)
- Labor Frictions and Asset Returns: Merz and Yashiv (2007), Bazdresch, Belo, and Lin (2009), Rosett (2001), Chen, Kacperczyk, and Ortiz-Molina (2011)
- Operating Leverage and Asset Returns: Rubinstein (1973), Lev (1974), Booth (1991), Carlson, Fisher, and Giammarino (2004), Garcia-Feijoo and Jorgensen (2010), Novy-Marx (2011)

Model

- From firm owner's perspective wage rigidity looks like leverage: in bad times firm's output (revenue) falls by more than labor expenses (cost)
- Falling wages are associated with rising operating leverage, higher risk, and higher expected equity returns
- Absent labor market frictions wage and output move together and these effects vanish
- Simple model based on Favilukis and Lin (2012) develops this intuition

Model

- Output: $Y_t = A_t N_t$ produced from labor N_t and TFP A_t
  - $\frac{A_{t+1}}{A_t} = e^{-0.5\sigma^2 + \sigma\epsilon_{t+1}}$
- Dividend: $D_t = (A_t - W_t)N_t$ is output minus labor expenses
- Firm makes no decisions and labor choice is fixed: $N_t = 1$
- Firm value is the discounted value of future dividends: $V_t = D_t + E_t[M_{t+1}V_{t+1}]$
  - $M_{t+1} = \beta \left(\frac{A_{t+1}}{A_t}\right)^{-\gamma}$

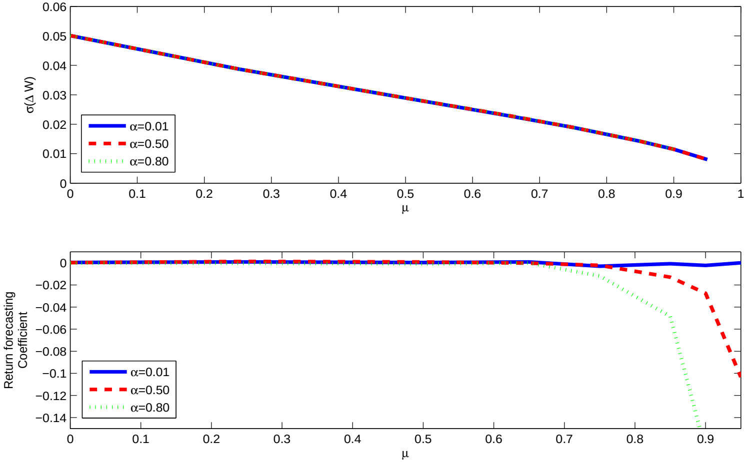
Model

- Wages are sticky: $W_t = \mu W_{t-1} + (1-\mu) W_t^*$ where W_t^* is the target wage
  - This wage process is similar to Shimer (2010) and Gertler and Triagari (2009)
- We assume that the target wage is proportional to productivity: $W_t^* = \alpha A_t$
  - In standard model with Cobb-Douglas production and no stickiness the wage is exactly equal to αA_t
- α is related to labor share
  - When no stickiness, α is exactly labor share
  - With stickiness labor share is time-varying and we refer to α as target labor share

Model

- We are able to analytically solve for the firm's value function, it depends on the average wage, productivity, and the underlying parameters
- We can also show this problem is a special case (with infinite adjustment costs) of a more general problem where the firm chooses labor but faces adjustment costs
  - Numerical solutions of more general problem are consistent with intuition of simple problem
- In the model wage growth is a source of risk for the firm, we regress $R_{t+1,t+5} = A_0 + B_0 \Delta W_t$ on simulated data
  - We are unable to solve for the elasticity of expected return with respect to wage growth analytically

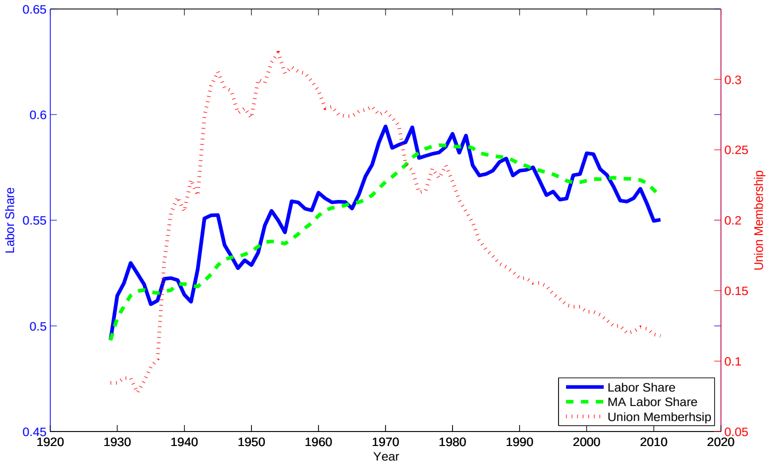
Model: Wage Growth forecasts Return



Model

- There is no predictability in frictionless ($\mu = 0$) model
- When wages are sticky ($\mu > 0$), wage growth negatively forecasts stock returns
  - Forecastability is increasing in μ
  - Output falls by more than wages in response to negative shocks. Because labor expenses are quasi-fixed cost, falling wages indicate rising labor leverage and higher risk for the firm
- There is no predictability if labor share (α) is zero
  - Forecastability is increasing in α
  - Higher labor share makes this channel stronger
- If target labor share moves through time, forecasting regressions should be conditioned on target labor share

Labor Share


0.65
0.6
0.55
0.5
0.45
Labor Share
0.3
0.25
0.2
0.15
0.1
0.05
Union Membership
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
Year
Labor Share
MA Labor Share
Union Memberhsip

Extended Model

- Time varying target labor share:
  $\alpha_{t+1} = (1-\rho)\overline{\alpha} + \rho\alpha_t + \sigma_\alpha \eta_{t+1}$
- Still able to find analytic solution
- Regress: $R_{t+1,t+5} = (A_0 + A_1\alpha_t) + (B_0 + B_1\alpha_t)\Delta W_t$
- $B_0 + B_1\overline{\alpha} < 0 \rightarrow$ wage growth negatively forecasts returns
- $B_1 < 0 \rightarrow$ forecastability is stronger when α_t is high

Empirical Specification

- Model implies future returns are forecastable by wage growth and strength should depend on labor share and rigidity
- $R_{t+1,t+k} = (A_0 + A_1 Z_t) + (B_0 + B_1 Z_t) X_t = A_0 + A_1 Z_t + B_0 X_t + B_1 Z_t X_t$
- Explanatory variable: year-over-year wage growth $X_t = \Delta W_t = \frac{W_t}{W_{t-1}}$
- Conditioning variable: ten year backward-looking moving average of labor share $Z_t = LS_t$
  - Just labor share, or HP-filtered labor share work equally well

Empirical Specification

- Unconditional if restrict $A_1 = 0$, $B_1 = 0$; otherwise conditional
- Will do this for (1) aggregate LHS and RHS, (2) industry LHS and RHS, (3) industry LHS and aggregate RHS
  - Doing (3) in case industry wages are mismeasured
- **Prediction 1:** $B_0 + B_1 Z_t < 0$ in conditional specifications ($B_0 < 0$ in unconditional)
- **Prediction 2:** $B_1 < 0$ in conditional specifications
- We test predictions 1 and 2 on aggregate and industry data. We refer to these as 1st stage tests

Empirical Specification

- Forecastability should be stronger in industries with more rigidity. We test this by comparing results from the 1st stage to measures of wage rigidity in the 2nd stage
- **Prediction 3:** There is a positive relationship between measures of wage rigidity and the *magnitude* of $B_0 + B_1 Z_t$ in conditional specifications (B_0 in unconditional)
- We test prediction 3 by running cross-sectional regressions of $B_0 + B_1 \overline{Z}$ on measures of wage rigidity
  - Because $B_0 + B_1 \overline{Z} < 0$, we should see a negative coefficients

Empirical Specification

- Why not $R_{t+1,t+k} = A_0 + (B_0 + B_1 Z_t)X_t = A_0 + B_0 X_t + B_1 Z_t X_t$?
- Because the signs of coefficients depend on the scale of the variables, ie X_t may lead to a different coefficient sign from $X_t - \overline{X}$
- In fact, even in our full specification only $B_0 + B_1 Z_t$ and B_1 matter, while A_0, A_1, and B_0 are irrelevant. Their level and sign may change depending on scaling
- Suppose true relationship is $Y_t = A_0 + A_1 Z_t + B_0 X_t + B_1 Z_t X_t + \epsilon_t$
  - If regress Y_t on X_t and Z_t recover coefficients A_0, A_1, B_0, B_1

Empirical Specification

- Suppose instead regress Y_t on $\hat{X}_t = X_t - \overline{X}$ and $\hat{Z}_t = Z_t - \overline{Z}$
  $Y_t = \hat{A}_0 + \hat{A}_1 \hat{Z}_t + \hat{B}_0 \hat{X}_t + \hat{B}_1 \hat{Z}_t \hat{X}_t + \epsilon_t$

- The relationship between original and new coefficients is:
  - $A_0 = \hat{A}_0 - \hat{A}_1 \overline{Z} - \hat{B}_0 \overline{X} + \hat{B}_1 \overline{XZ}$
  - $A_1 = \hat{A}_1 - \hat{B}_1 \overline{X}$
  - $B_0 = \hat{B}_0 - \hat{B}_1 \overline{Z} \rightarrow B_0 + B_1 E[Z] = \hat{B}_0 + \hat{B}_1 E[\hat{Z}]$
  - $B_1 = \hat{B}_1$

- Thus B_0 and $B_0 + B_1 E[Z]$ are invariant to scale, while others are not
  - We don't know if we should be using $\Delta W_t = \frac{W_t}{W_{t-1}}$ or $\Delta W_t = log(\frac{W_t}{W_{t-1}})$ or any other scaling

Data

- LHS: $R_{t+1,t+k} = \sum_{s=1,k} R^e_s - R^f_s$; both aggregate and industry returns are from Ken French's website
- Wage growth: $\Delta W_t = \frac{W_t}{W_{t-1}}$; wage is nominal wage from NIPA divided by CPI
- Labor share: Nominal compensation divided by nominal GDP from NIPA
  - Industry GDP is unavailable, we define industry GDP as Compensation + Pre-Tax Profit + Consumption of Fixed Capital
- Aggregate data available 1929-2011, industry data available 1929-2000 because of major change of industry classification in 2000
- We match NIPA industries to Fama and French industries and have 26 matches

Data

- In 2nd stage we need proxies for wage rigidity (ρ) for each industry

- Model suggests high μ implies:
  - High autocorrelation of wage growth: $\rho^1 = AC(\Delta W)$
  - Low volatility of wage growth: $\rho^2 = \sigma(\Delta W)^{-1}$
  - Low ratio of wage growth volatility to profit growth volatility: $\rho^3 = \frac{\Delta\Pi}{\Delta W}$ where we define $\Delta\Pi_{t+1} = \frac{\Pi_{t+1}-\Pi_t}{W_t}$

Inference

- Standard asymptotic inference difficult here because our statistics are fairly complicated
- For example consider testing whether fraction of industries with $B_0 + B_1 Z_t < 0$ is significantly different from 50%
- Even for individual industries testing $B_0 + B_1 Z_t < 0$ is complicated
  - Joint significance requires F-test but here additional uncertainty about Z
- Correlations across industries make testing significance of fraction even more complicated, as in Gibbons, Ross, Shanken (1989)
- Finally, we have three separate (though not fully independent) hypotheses. We wish to test them jointly

Bootstrap

- All inference reported in the paper (even simple statistics) are boostrapped
  - Where traditional inference is simple, we confirm that it is consistent with bootstrapped results
- Suppose we regress y_t on x_t and find $y_t = \widetilde{\beta} x_t + \epsilon_t$. Two ways to bootstrap:
  - Create fake data sets where average slope is $\widetilde{\beta}$, then test how often the slope is below zero
  - Create fake data sets where average slope is zero, then test how often the slope is above $\tilde{\beta}$ (Fama and French (2010), Kosowski, Timmermann, Wermers, and White (2006))
- Either approach works fine for any individual regression, however because our data is multi-dimensional, uses long-horizon returns, and doesn't end at same time, it is important to keep structure the same. This is easier with 2nd approach.

Bootstrap

- We use block bootstrap with block size $b = 15$
- To keep structure of data set we do not reshuffle the RHS variables, we only reshuffle the LHS (returns)
- Randomly pick $a_1 \in (1, T)$ and set $(\overline{R}_1, \overline{R}_2, ...\overline{R}_b) = (R_{a_1}, R_{a_1+1}, ...R_{a_1+b-1})$
- Randomly pick $a_2 \in (1, T)$ and set $(\overline{R}_{b+1}, \overline{R}_{b+2}, ...\overline{R}_{b+b}) = (R_{a_2}, R_{a_2+1}, ...R_{a_2+b-1})$
- Continue until we get to $\overline{R}_T$
- If at any time $a_i > T - b$ we continue setting $\overline{R}_t = R_s$ until we reach $R_s = R_T$, then we "roll over" and restart at $s = 1$
- Use $(\overline{R}_1, \overline{R}_2, ...\overline{R}_T)$ to compute long horizon returns and regress on RHS
- We repeat 500 times. For each statistic we report p-value as the fraction of samples in which point estimate was more extreme than actual

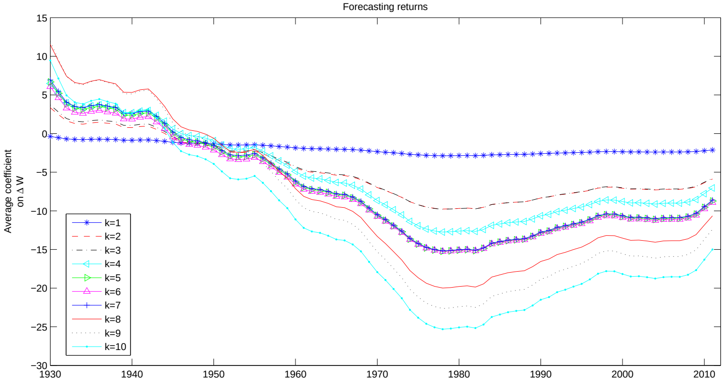
Forecasting Return with Wage Growth, 1929-2011

	Unconditional			Conditional on Labor Share				
k	B_0	p-val	R^2	B_1	p-val	$B_0 + B_1 LS$	p-val	R^2
1	-1.04	0.22	0.01	-30.51	0.29	-1.95	0.13	0.03
2	-1.73	0.23	0.01	-160.34	0.03	-4.94	0.03	0.15
3	-0.86	0.37	0.00	-164.88	0.07	-4.82	0.06	0.20
4	-0.36	0.46	0.00	-235.02	0.02	-5.67	0.07	0.27
5	-0.89	0.40	0.00	-267.91	0.02	-7.17	0.03	0.32
6	-0.87	0.44	0.00	-260.68	0.03	-7.40	0.06	0.33
7	-0.29	0.52	0.00	-270.26	0.03	-7.03	0.09	0.31
8	0.11	0.54	0.00	-385.21	0.01	-8.40	0.06	0.40
9	-0.57	0.47	0.00	-422.33	0.01	-9.92	0.05	0.42
10	-2.62	0.34	0.01	-425.18	0.01	-12.51	0.03	0.43
Avg	-0.91	0.40	0.00	-262.23	0.01	-6.98	0.03	0.29

Forecasting Return with Wage Growth, 1954-2011

	Unconditional			Conditional on Labor Share				
k	B_0	p-val	R^2	B_1	p-val	$B_0 + B_1 LS$	p-val	R^2
1	-2.80	0.09	0.05	74.75	0.71	-4.73	0.03	0.10
2	-7.14	0.02	0.18	32.68	0.59	-10.96	0.00	0.29
3	-5.91	0.07	0.11	-110.88	0.38	-8.64	0.03	0.18
4	-6.96	0.06	0.13	-106.24	0.39	-10.53	0.01	0.22
5	-8.39	0.04	0.16	-177.21	0.30	-11.73	0.01	0.23
6	-8.83	0.06	0.16	-276.51	0.23	-11.13	0.01	0.22
7	-8.43	0.12	0.13	-150.08	0.36	-9.89	0.02	0.15
8	-10.61	0.08	0.19	-378.12	0.17	-11.12	0.02	0.24
9	-12.23	0.08	0.21	-443.66	0.15	-12.28	0.01	0.26
10	-15.00	0.05	0.28	-317.19	0.24	-15.19	0.01	0.30
Avg	-8.63	0.05	0.16	-185.25	0.27	-10.62	0.00	0.22

Forecasting coefficient over time



Comparison to alternative variables

$R_{t+1,t+k} = A_0 + B_{\Delta W} X_t + B_{PE} PE_t$ where
$X = \Delta W$ or $X = -(B_0 + B_1 LS)\Delta W$

	Unconditional				Conditional on Labor Share			
k	$B_{\Delta W}$	p-val	B_{PE}	p-val	$B_{\Delta W}$	p-val	B_{PE}	p-val
1	-1.05	0.21	-0.00	0.24	-0.03	0.26	-0.00	0.28
2	-1.74	0.26	-0.01	0.16	-0.01	0.13	-0.00	0.20
3	-0.80	0.39	-0.01	0.13	-0.02	0.06	-0.01	0.16
4	-0.22	0.49	-0.01	0.14	-0.02	0.07	-0.01	0.20
5	-0.71	0.42	-0.02	0.12	-0.02	0.07	-0.01	0.15
6	-0.64	0.45	-0.02	0.04	-0.02	0.04	-0.02	0.05
7	0.01	0.54	-0.02	0.07	-0.02	0.06	-0.02	0.08
8	0.48	0.58	-0.03	0.10	-0.02	0.05	-0.02	0.12
9	-0.11	0.50	-0.03	0.09	-0.02	0.05	-0.03	0.11
10	-1.15	0.43	-0.05	0.02	-0.02	0.06	-0.04	0.00
Avg	-0.59	0.41	-0.02	0.07	-0.02	0.04	-0.02	0.08

Forecasting Wage Growth and GDP with Returns

$Y_{t+1,t+k} = A_0 + B_0 R_{t-1,t}$ where $Y_{t+1,t+k}$ is $\sum_{s=1,k} \Delta GDP_{t+s}$ or $\sum_{s=1,k} \Delta W_{t+s}$ or $\sum_{s=1,k} \Delta W_{t+s} - \Delta GDP_{t+s}$

k	ΔGDP	p-val	ΔW	p-val	$\Delta W - \Delta GDP$	p-val
1	0.12	0.00	0.02	0.05	-0.10	0.00
2	0.13	0.01	0.02	0.10	-0.11	0.01
3	0.13	0.01	0.04	0.01	-0.09	0.08
4	0.10	0.10	0.05	0.00	-0.04	0.30
5	0.07	0.14	0.06	0.01	-0.01	0.44
6	0.08	0.12	0.07	0.00	-0.01	0.44
7	0.12	0.08	0.09	0.00	-0.03	0.36
8	0.18	0.02	0.10	0.00	-0.08	0.17
9	0.22	0.01	0.12	0.00	-0.11	0.15
10	0.18	0.08	0.13	0.00	-0.05	0.34
Avg	0.13	0.00	0.07	0.00	-0.06	0.10

Cross-Sectional Results

- We have four possible specifications:

  (i) Unconditional, forecasts of industry returns with aggregate variables: $R^i_{t+1,t+k} = A_0 + B_0 \Delta W_t$

  (ii) Conditional, forecasts of industry returns with aggregate variables: $R^i_{t+1,t+k} = (A_0 + A_1 LS_t) + (B_0 + B_1 LS_t)\Delta W_t$

  (iii) Unconditional, forecasts of industry returns with industry variables: $R^i_{t+1,t+k} = A_0 + B_0 \Delta W^i_t$

  (iv) Conditional, forecasts of industry returns with industry variables: $R^i_{t+1,t+k} = (A_0 + A_1 LS^i_t) + (B_0 + B_1 LS^i_t)\Delta W^i_t$

1st Stage: Fraction of Negative Coefficients

	1	2	3	4	5	6	7	8	9	10	Avg	p-val
1930-2000, (i)	0.77	0.77	0.46	0.31	0.42	0.42	0.42	0.38	0.50	0.62	0.51	0.50
1930-2000, (ii)	0.92	0.96	0.85	0.85	0.85	0.88	0.88	0.85	0.88	0.92	0.88	0.05
1930-2000, (iii)	0.85	0.81	0.77	0.73	0.81	0.73	0.77	0.73	0.77	0.81	0.78	0.04
1930-2000, (iv)	0.77	0.73	0.62	0.62	0.69	0.69	0.69	0.65	0.77	0.85	0.71	0.11
1954-2000, (i)	0.96	0.96	0.85	0.81	0.81	0.81	0.81	0.77	0.85	0.88	0.85	0.10
1954-2000, (ii)	1.00	0.96	0.88	0.81	0.88	0.88	0.85	0.81	0.77	0.85	0.87	0.05
1954-2000, (iii)	0.77	0.88	0.73	0.65	0.85	0.85	0.85	0.85	0.85	0.92	0.82	0.03
1954-2000, (iv)	0.81	0.85	0.73	0.69	0.77	0.81	0.77	0.81	0.81	0.81	0.78	0.03

1st Stage: R^2

	1	2	3	4	5	6	7	8	9	10	Avg
1930-2000, (i)	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.02
1930-2000, (ii)	0.05	0.12	0.18	0.22	0.25	0.25	0.27	0.35	0.37	0.38	0.24
1930-2000, (iii)	0.03	0.03	0.04	0.02	0.01	0.01	0.02	0.02	0.02	0.03	0.02
1930-2000, (iv)	0.08	0.10	0.13	0.12	0.11	0.12	0.13	0.14	0.15	0.17	0.12
1954-2000, (i)	0.05	0.11	0.07	0.08	0.09	0.09	0.10	0.14	0.15	0.18	0.11
1954-2000, (ii)	0.10	0.19	0.13	0.16	0.16	0.15	0.16	0.22	0.24	0.27	0.18
1954-2000, (iii)	0.05	0.08	0.05	0.04	0.04	0.04	0.04	0.06	0.07	0.08	0.05
1954-2000, (iv)	0.08	0.12	0.12	0.13	0.15	0.17	0.18	0.20	0.22	0.24	0.16

2nd Stage: 1929-2000

	(i)						(ii)					
	AC(ΔW)		$\sigma(\Delta W)$		$\frac{\sigma(\Delta W)}{\Delta\Pi}$		AC(ΔW)		$\sigma(\Delta W)$		$\frac{\sigma(\Delta W)}{\Delta\Pi}$	
k	Slope	p-val	Slope	p-val	Slope	p-val	Slope	p-val	Slope	p-val	Slope	p-val
1	0.14	0.56	-0.66	0.00	-2.38	0.02	-0.61	0.42	-0.82	0.01	-2.22	0.03
2	-2.29	0.25	-0.79	0.06	-2.38	0.10	-3.85	0.15	-1.14	0.02	-3.16	0.07
3	-3.03	0.24	-0.79	0.12	-3.58	0.09	-5.53	0.12	-1.37	0.04	-5.20	0.04
4	-3.85	0.21	-0.99	0.11	-5.71	0.05	-7.37	0.07	-1.59	0.06	-7.38	0.03
5	-5.65	0.14	-1.25	0.10	-7.56	0.02	-9.99	0.02	-1.84	0.05	-8.99	0.02
6	-8.54	0.07	-1.55	0.08	-8.29	0.02	-13.97	0.00	-2.13	0.05	-9.37	0.03
7	-7.81	0.10	-1.75	0.09	-8.78	0.03	-14.69	0.01	-2.56	0.04	-10.65	0.03
8	-9.51	0.09	-2.26	0.05	-10.30	0.02	-17.58	0.00	-3.12	0.02	-13.14	0.01
9	-9.93	0.09	-2.58	0.04	-10.15	0.03	-18.18	0.00	-3.42	0.02	-13.39	0.01
10	-10.37	0.08	-2.60	0.05	-9.65	0.04	-18.73	0.01	-3.36	0.03	-12.79	0.02
Avg	-6.09	0.10	-1.52	0.05	-6.88	0.03	-11.05	0.01	-2.13	0.03	-8.63	0.01

2nd Stage: 1929-2000

	(iii)						(iv)					
	AC(ΔW)		$\sigma(\Delta W)$		$\frac{\sigma(\Delta W)}{\Delta\Pi}$		AC(ΔW)		$\sigma(\Delta W)$		$\frac{\sigma(\Delta W)}{\Delta\Pi}$	
k	Slope	p-val	Slope	p-val	Slope	p-val	Slope	p-val	Slope	p-val	Slope	p-val
1	-0.72	0.28	-0.86	0.02	-2.24	0.03	-1.64	0.17	-0.55	0.06	-1.39	0.12
2	-3.22	0.07	-0.98	0.04	-1.04	0.27	-5.00	0.03	-0.49	0.17	-0.20	0.43
3	-4.99	0.03	-0.89	0.09	-0.25	0.45	-7.54	0.01	-0.36	0.26	0.22	0.54
4	-4.38	0.08	-0.47	0.25	-0.11	0.48	-8.86	0.01	-0.12	0.44	-0.06	0.48
5	-3.60	0.14	-0.18	0.40	-0.47	0.42	-8.03	0.03	0.23	0.61	-0.28	0.45
6	-2.75	0.22	-0.24	0.37	-1.89	0.24	-7.09	0.07	0.28	0.62	-1.16	0.36
7	-0.53	0.45	-0.11	0.45	-1.81	0.29	-4.88	0.19	0.15	0.57	-2.03	0.28
8	-2.51	0.28	-0.40	0.35	-2.55	0.21	-8.72	0.08	-0.01	0.51	-2.48	0.22
9	-2.77	0.30	-0.69	0.30	-2.99	0.16	-8.55	0.11	-0.08	0.48	-2.68	0.22
10	-4.07	0.22	-1.19	0.18	-4.01	0.13	-9.73	0.09	-0.36	0.40	-3.36	0.18
Avg	-2.96	0.17	-0.60	0.20	-1.74	0.21	-7.00	0.05	-0.13	0.43	-1.34	0.28

Fama-MacBeth

- Each year we regress $R^i_{t+1,t+k}$ on industry characteristics
- Specification 1: Unconditional
  $R^i_{t+1,t+k} = A_0 + B_0 \Delta W^i_t$
- Specification 2: Conditioning on labor share
  $R^i_{t+1,t+k} = A_0 + A_1 LS^i_t + B_0 \Delta W^i_t + B_1 LS^i_t \Delta W^i_t$
- Specification 3: Conditioning on rigidity
  $R^i_{t+1,t+k} = A_0 + A_1 \rho^j_t + B_0 \Delta W^i_t + B_1 \rho^j_t \Delta W^i_t$ where ρ is one of three (rolling) rigidity measures
- Specification 4: Conditioning on rigidity and labor share
  $R^i_{t+1,t+k} = A_0 + A_1 LS^i_t + A_2 \rho^j_t + B_0 \Delta W^i_t + B_1 LS^i_t \Delta W^i_t + B_2 \rho^j_t \Delta W^i_t$

Fama-MacBeth

k	1	2	3	4	5	6	7	8	9	10	Avg	p-val
B_0	0.09	-0.28	-0.58	-0.58	-0.77	-0.87	-0.92	-1.10	-1.19	-1.43	-0.76	0.04
B_1	-1.20	-0.72	-3.50	-3.50	-3.49	-2.31	-1.76	-1.53	-0.93	0.27	-1.87	0.37
$B_0 + B_1 LS$	-0.13	-0.62	-0.89	-0.89	-0.95	-1.22	-1.43	-1.73	-2.07	-2.34	-1.23	0.02
B_1	-1.17	-0.87	-0.73	-0.73	0.91	-1.08	-0.85	0.09	0.76	0.84	-0.28	0.57
$B_0 + B_1 \rho^1$	0.17	-0.11	-0.20	-0.20	-0.06	-0.19	-0.19	-0.40	-0.57	-0.72	-0.25	0.27
B_1	-0.02	-0.05	-0.07	-0.07	-0.09	-0.11	-0.12	-0.12	-0.14	-0.15	-0.09	0.01
$B_0 + B_1 \rho^2$	-0.06	-0.64	-1.19	-1.19	-1.70	-2.31	-2.43	-2.89	-3.36	-3.90	-1.97	0.03
B_1	-0.07	-0.07	-0.16	-0.16	-0.34	-0.41	-0.48	-0.55	-0.64	-0.59	-0.35	0.09
$B_0 + B_1 \rho^3$	-0.17	-0.54	-0.96	-0.96	-1.41	-1.73	-1.90	-2.30	-2.48	-2.52	-1.50	0.00
B_1	-2.08	-1.91	-3.80	-3.80	-4.43	-3.32	-1.36	-0.73	-1.40	-0.16	-2.30	0.29
B_2	-0.74	-0.67	-0.85	-0.85	0.42	-1.09	-1.17	-0.22	0.72	1.16	-0.33	0.63
$B_0 + B_1 LS + B_2 \rho^1$	0.12	-0.35	-0.55	-0.55	-0.24	-0.51	-0.64	-0.97	-1.27	-1.28	-0.62	0.11
B_1	-0.90	-1.57	-4.13	-4.13	-3.78	-2.99	-2.54	-2.29	-3.92	-4.16	-3.04	0.29
B_2	-0.02	-0.05	-0.06	-0.06	-0.08	-0.09	-0.10	-0.09	-0.10	-0.12	-0.08	0.01
$B_0 + B_1 LS + B_2 \rho^2$	-0.29	-0.93	-1.49	-1.49	-1.87	-2.55	-2.73	-3.20	-3.56	-4.19	-2.23	0.02
B_1	-1.28	-0.11	-3.31	-3.31	-3.30	-2.31	-1.47	-1.42	-1.07	-0.08	-1.76	0.44
B_2	-0.07	-0.02	-0.11	-0.11	-0.28	-0.36	-0.39	-0.47	-0.54	-0.49	-0.28	0.17
$B_0 + B_1 LS + B_2 \rho^3$	-0.44	-0.96	-1.27	-1.27	-1.58	-2.10	-2.37	-2.84	-3.23	-3.31	-1.94	0.00

Joint Tests

- We jointly test our three hypotheses: (1) Negative relationship in aggregate, (2) Negative relationship in 1st stage of industry, (3) Relationship most negative for rigid industries in 2nd stage of industry
- Choice of using conditional or unconditional regressions
- Choice of using aggregate or industry RHS in industry regressions
- Choice of one of three definitions of rigidity in 2nd stage
- In total we try 12 different joint tests (2x2x3). Highest p-value is 0.06, all others between 0.00 and 0.03

Conclusion

- Labor market frictions lead to wage growth being an additional source of risk for firms, this is especially true for firms with high labor share or high rigidity
- We show that consistent with this, negative wage growth is associated with higher expected return
- This is true for aggregate data
- This is true for industry data
- Additionally, more rigid industries have a more negative relationship between wage growth and expected return