

Internet Appendix for **Aggregate Labor Flow: A Leading Economic Indicator**

January 2022

This Internet Appendix reports the results for supplementary and robustness tests:

Table IA 1: Correlation matrix

Table IA 2: Supplementary results in Table 2

Table IA 3: Supplementary results in Table 3

Table IA 4: Additional forecasting results for stock return

Table IA 5: Robust check for asset allocation

Table IA 2. Additional Results for Unemployment

This table reports the estimation results of following regression,

$$Y_{t+1} = \alpha + \beta \Delta L_t^k + \psi \mathbf{L}_t + \sum_{i=0}^5 \theta_i Y_{t-i} + \varepsilon_{t+1},$$

where Y_{t+1} represents the monthly growth of unemployment rate or the monthly growth of total non-farm payroll; ΔL^k denotes the monthly change in gross labor inflow (ΔL^+) or the monthly change in gross labor outflow (ΔL^-); \mathbf{L} represents a vector of control variables that include the change in worker flow from CPS (ΔW^{CPS}), change in worker flow from JOLTS (ΔW^{JOLTS}), net hiring rate (HR), vacancy index (VI), labor force participation rate (LFPR), labor market tightness (LMT), real Gross Domestic Product growth rate (GDPG), treasury bill rate (TBL), and term spread (TMS). All variables are standardized to have zero mean and unit variance. Panels A and B report the forecasting results for growth of unemployment rate and growth of total non-farm payroll, respectively. Reported are the regression slopes and the adjusted R^2 s in percentage form. Brackets below the slope estimates report the Newey and West (1987) t -statistics. To save space, we do not report the results for lagged Y . *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Panel A: Growth of Unem.		Panel B: Payroll Growth	
	(1)	(2)	(3)	(4)
ΔL^+	-0.01 [-0.21]		0.04 [1.46]	
ΔL^-		0.12*** [3.57]		0.00 [-0.07]
ΔW^{CPS}	0.05 [0.32]	0.04 [0.23]	-0.08 [-1.52]	-0.08* [-1.69]
ΔW^{JOLTS}	0.14*** [3.07]	0.15*** [3.58]	0.06 [0.91]	0.05 [0.80]
HR	0.11* [1.93]	0.10* [1.84]	-0.02 [-0.68]	-0.02 [-0.71]
VI	0.34** [2.29]	0.36** [2.48]	-0.38*** [-4.59]	-0.39*** [-4.56]
LFPR	0.67*** [4.11]	0.66*** [4.24]	-0.41*** [-3.63]	-0.41*** [-3.56]
LMT	-0.10 [-1.33]	-0.10 [-1.28]	0.14*** [3.83]	0.13*** [3.58]
GDPG	-0.23*** [-3.33]	-0.23*** [-3.30]	0.16*** [3.32]	0.16*** [3.32]
TBL	-0.59*** [-3.39]	-0.59*** [-3.49]	0.35*** [2.65]	0.35** [2.62]
TMS	-0.15 [-1.09]	-0.14 [-1.05]	-0.04 [-0.42]	-0.04 [-0.44]
Adj. R^2	28.06	29.21	76.43	76.28

Table IA 3. Additional Results for GDP Growth

This table presents the estimation results of following predictive regression,

$$Z_{t+h} = \alpha + \beta \Delta L_t^k + \psi \mathbf{L}_t + \sum_{i=0}^1 \theta_i Z_{t-i} + \varepsilon_{t+h},$$

where Z_{t+h} represents the h -quarter ahead real GDP growth (GDPG); ΔL^k denotes the change in gross labor inflow (ΔL^+) or the change in gross labor outflow (ΔL^-) at the end of quarter t ; and \mathbf{L}_t represents a vector of alternative control variables at the end of quarter t , including the change in worker flow from CPS (ΔW^{CPS}), change in worker flow from JOLTS (ΔW^{JOLTS}), net hiring rate (HR), vacancy index (VI), labor force participation rate (LFPR), labor market tightness (LMT), treasury bill rate (TBL), and term spread (TMS). Panel A and B report the forecasting results for one-quarter and three-quarter horizons, respectively. All variables are standardized to have zero mean and unit variance. Reported are the regression slopes and the adjusted R^2 s in percentage form. Brackets below the slope estimates report the t -statistics. To save space, we do not report the results for lagged Z . *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The sample period extends from January 1990 through May 2018, except for ΔW^{JOLTS} which is available since December 2000.

	Panel A: One-quarter Horizon		Panel B: Three-quarter Horizon	
	(1)	(2)	(3)	(4)
ΔL^+	0.05 [0.81]		-0.02 [-0.39]	
ΔL^-		-0.07 [-0.83]		-0.02 [-0.39]
ΔW^{CPS}	-0.16 [-0.83]	-0.18 [-0.90]	-0.25* [-1.91]	-0.25* [-1.91]
ΔW^{JOLTS}	-0.10 [-1.21]	-0.10 [-1.22]	-0.16 [-1.37]	-0.16 [-1.37]
HR	-0.14 [-1.31]	-0.15 [-1.38]	-0.06 [-0.50]	-0.06 [-0.50]
VI	-0.28 [-0.87]	-0.29 [-0.92]	-0.83** [-2.17]	-0.83** [-2.17]
LFPR	-0.29 [-0.84]	-0.31 [-0.88]	-0.93** [-1.98]	-0.93** [-1.98]
LMT	0.14** [2.35]	0.14** [2.35]	0.16 [1.63]	0.16 [1.63]
TBL	0.31 [0.94]	0.35 [1.02]	0.99** [2.20]	0.99** [2.20]
TMS	-0.01 [-0.10]	0.02 [0.17]	0.15 [0.79]	0.15 [0.79]
Adj. R^2	13.50	13.73	20.76	20.76

Table IA 4. Additional Results of Forecasting Stock Returns

Panel A reports the results of following regression,

$$R_{t+1} = \alpha + \beta \Delta L_t^k + \psi \mathbf{L}_t + \varepsilon_{t+1},$$

where R_{t+1} is the monthly stock market excess return, ΔL_t^k denotes the change in labor inflow (ΔL^+) or the change in labor outflow (ΔL^-), and \mathbf{L}_t represents a vector of control variables: the change in worker flow from CPS (ΔW^{CPS}), change in worker flow from JOLTS (ΔW^{JOLTS}), net hiring rate (HR), vacancy index (VI), labor force participation rate (LFPR), labor market tightness (LMT), real Gross Domestic Product growth rate (GDPG), treasury bill rate (TBL), and term spread (TMS). All forecasting variables are standardized to have zero mean and unit variance. Reported are the regression slopes and the adjusted R^2 s in percentage form. Brackets below the slope estimates report the Newey and West (1987) t -statistics (t -stat.). Panel B reports the out-of-sample R_{OS}^2 statistics (in percentage form) of Campbell and Thompson (2008), the annualized CER gains (Δ) in percentage form, and the annualized Sharpe ratios (SR). The out-of-sample period is from January 1995 to May 2018. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Panel A: In-sample Results		Panel A: Out-of-sample Results		
	(1)	(2)	R_{OS}^2 (%)	Δ	SR
ΔL^+	0.46**		-0.36	-1.17	0.20
	[2.16]				
ΔL^-		-0.30	0.42*	-0.89	0.22
		[-1.32]			
ΔW^{CPS}	-0.13	-0.24			
	[-0.57]	[-1.11]			
ΔW^{JOLTS}	0.16	0.08			
	[0.62]	[0.34]			
HR	-0.46	-0.48			
	[-1.41]	[-1.50]			
VI	-2.65**	-2.76**			
	[-2.62]	[-2.60]			
LFPR	-1.16	-1.13**			
	[-1.01]	[-0.98]			
LMT	0.39	0.35			
	[1.31]	[1.19]			
GDPG	0.22	0.23			
	[0.83]	[0.96]			
TBL	-0.05	-0.07			
	[-0.04]	[-0.06]			
TMS	-2.45***	-2.52***			
	[-3.80]	[-3.69]			
Adj. R^2	9.33	8.60			

Table IA 5. Additional Asset Allocation Results

This table reports the asset allocation performance for a mean-variance investor with a risk aversion coefficient (γ) of one or five, who allocates monthly between equities and risk-free bills using the out-of-sample return forecasts for stock market excess returns. We construct the out-of-sample forecasts recursively based on one of the variables: the change in net labor flow (ΔL), the change in labor inflow (ΔL^+), and the change in labor outflow (ΔL^-). To assess the asset allocation performance, we use the annualized certainty equivalent return (CER) gain (in percentage) and the annualized Sharpe ratio (SR) of investment portfolio. The out-of-sample period is from January 1995 to May 2018.

	Panel A: $\gamma = 1$		Panel B: $\gamma = 5$	
	CER gain	SR	CER gain	SR
ΔL	2.18	0.35	1.67	0.43
ΔL^+	-0.21	0.23	-1.60	0.17
ΔL^-	1.42	0.32	-0.11	0.31