

Gold, Platinum, and industry stock returns

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Motivation

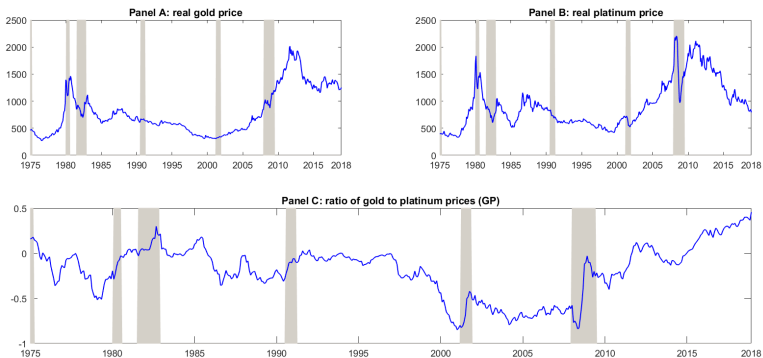
- Stock return predictability is of interest for a long time.
- Most of studies address return predictability at the market level.
 - Financial ratios: dividend yields, the earnings-price ratio, the book-to-market ratio . . .
 - Business cycle indicators: the consumption-wealth ratio, the output gap, the gold-to-platinum price ratio (GP) . . .
- In practice, investors do not always hold well-diversified market portfolios.
 - Industry rotation strategy.
 - Sectors with more personal experience or private advantages. (Roche et al. 2013, Kacperczyk et al. 2005)

This Paper

- Extend the work of Huang and Kilic (2019, JFE).
- Use the gold-to-platinum price ratio (GP).
- Predict short- and intermediate-horizon US industry stock returns.
- In-sample & out-of-sample predictability.
- Economic significance of GP forecasts.

Channel of GP predictability ability

Figure: Gold, Platinum, and GP over business cycles



The shaded gray bars indicate recession periods defined by the NBER.

Why GP ratio?

- 1 GP not incorporate any forms of asset prices.
 - Using GP removes the predictability bias arising due to fads in prices being washed out. (Cochrane, 2005).
- 2 Business cycle indicators including GP ...
 - able to shift the term structure of expected returns.
 - predict returns over business cycles more precisely.
- 3 GP is a high-frequency and model-free ratio
 - useful to form forecasts in real-time trading.
- 4 Using GP at the industry level
 - assess the robustness / channel of GP predictability ability.

Data

- Monthly average a.m. gold and platinum prices from the London Bullion Market Association (LBMA)
- Monthly VW returns of 49 industries from Kenneth R. French's website
- Sample Period: 1975 to 2018
 - post-gold standard era
 - not oil-shock period, 1973 to 1974.

In-sample predictability

Framework

$$\frac{12}{h} \sum_{i=1}^h \left[\log R_{t+i} - \log R_{t+i}^f \right] = \beta_0 + \beta_1 X_t + \varepsilon_{t+h},$$

Controlling for the small sample bias at the one-month horizon
(Lewellen 2004, JFE)

$$\log R_{t+1} - \log R_{t+1}^f = \beta_0 + \beta_1 X_t + \gamma \mu_t + \nu_t,$$

where μ_t is the residual of the regression $X_{t+1} = \phi + \rho X_t + \mu_t$
and ν_t is the error term.

Weighted least squares estimator (Johnson 2019, RAPS).

One-month horizon: Cyclical industries

Table: Short-term forecasts by GP and others predictors

Industry	GP	log PD	log PE	BM	CAY	Output
Market	0.184***	-0.068***	-0.043	0.062	0.169	-0.810**
Chips	0.396***	-0.118	-0.039	0.113	-0.917	-1.264*
Softw	0.345***	-0.170**	-0.086	0.179	-0.449	-1.040*
Hardw	0.326**	-0.055	0.014	0.033	-0.16	-0.837
Autos	0.291***	-0.117**	0.015	0.111	0.024	-1.847***
Books	0.259***	-0.141***	-0.069	0.221***	0.072	-1.025**
Telcm	0.259***	-0.102**	-0.084	0.094	0.607	-1.026**
LabEq	0.257**	-0.090	-0.061	0.119	-1.791	-0.854*
BusSv	0.243***	-0.122***	-0.103	0.164**	-1.061	-0.783**
Fun	0.235**	-0.108*	-0.046	0.151	-1.414	-0.922*
Rtail	0.225***	-0.065*	-0.026	0.066	0.187	-1.110***
Aero	0.222**	-0.097*	-0.086	0.155	-1.252	-0.691
Fin	0.214**	-0.076*	-0.010	0.070	0.645	-0.700
Banks	0.210**	-0.048	-0.022	0.027	1.384	-1.095**

The table reports values of the coefficient β_1 . *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

One-month horizon: Defensive industries

Table: Short-term forecasts by GP and others predictors

Industry	GP	log PD	log PE	BM	CAY	Output
RIEst	0.082	-0.128	-0.050	0.214*	-2.096	-0.809
Hlth	0.080	-0.205**	-0.198*	0.376***	-2.549	0.011
Steel	0.079	-0.035	-0.013	0.010	-0.009	-0.593
Food	0.073	-0.092**	-0.073	0.082*	1.783**	-0.958***
Guns	0.036	-0.057	-0.096	0.118	-1.695	-0.296
Util	0.018	-0.016	-0.052	0.033	-0.052	-0.296
Agric	0.007	-0.033	-0.093*	0.050	0.087	0.172
Cnstr	-0.005	-0.029	-0.051	0.072	-0.902	0.124
Ships	-0.025	0.041	-0.001	0.020	-3.047*	-0.025
Gold	-0.055	-0.087	0.020	0.126	-1.207	-0.515
Oil	-0.122	-0.019	-0.053	0.036	0.499	0.144
Mines	-0.146	-0.003	0.078	-0.039	0.176	-0.301
Smoke	-0.154	-0.043	-0.074	0.066	0.992	-0.335
Coal	-0.392	0.117	0.122	-0.125	1.635	1.212

The table reports values of the coefficient β_1 . *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Medium-term predictability: Top market correlation

Industry	3-month horizon		1-year horizon		5-year horizon	
	Coef.	R_{adj}^2 (%)	Coef.	R_{adj}^2 (%)	Coef.	R_{adj}^2 (%)
Market	0.205***	3.30	0.227***	16.13	0.124***	28.51
BusSv	0.256***	3.30	0.26***	14.97	0.139***	24.99
Fin	0.254**	2.24	0.297***	12.68	0.191***	31.21
ElcEq	0.202**	1.61	0.207**	8.32	0.095***	12.41
Mach	0.123	0.36	0.134*	2.78	0.013	0.06
Whlsl	0.177**	1.62	0.198***	9.77	0.077***	11.26
LabEq	0.279**	2.37	0.254***	8.72	0.071***	4.90
BldMt	0.155*	0.81	0.190***	6.56	0.096***	11.81
Chems	0.135*	0.71	0.151**	4.64	0.035**	1.86
Chips	0.434***	5.10	0.415***	15.73	0.205***	20.29
Books	0.292***	3.78	0.347***	19.61	0.283***	51.13
Rtail	0.242***	2.99	0.231***	14.07	0.112***	19.85
Trans	0.141**	0.84	0.181***	8.21	0.048***	4.85
Rubbr	0.213***	1.87	0.228***	11.65	0.099***	15.85

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Medium-term predictability: Bottom market correlation

Industry	3-month horizon		1-year horizon		5-year horizon	
	Coef.	R_{adj}^2 (%)	Coef.	R_{adj}^2 (%)	Coef.	R_{adj}^2 (%)
Ships	0.019	-0.18	0.070	0.44	-0.054	1.12
FabPr	0.162*	0.57	0.168**	3.44	-0.023	0.26
Mines	-0.114	0.13	-0.134	1.56	-0.182	21.40
Oil	-0.085	0.21	-0.052	0.45	-0.023	0.92
Food	0.096*	0.65	0.136***	6.20	0.117***	19.98
Hlth	0.102	0.13	0.080	0.57	0.057	1.71
Beer	0.158***	1.66	0.177***	9.44	0.134***	20.66
Agric	0.028	-0.16	0.023	-0.09	-0.006	-0.15
Soda	0.208**	1.72	0.179***	5.69	0.058**	3.31
Guns	0.056	-0.06	0.090	1.06	0.06**	3.21
Util	0.032	-0.07	0.083*	2.72	0.033**	4.18
Coal	-0.316	1.00	-0.274	3.10	-0.220	9.03
Smoke	-0.137	0.61	-0.078	0.81	-0.018	0.19
Gold	-0.114	0.02	-0.246	3.81	-0.149	10.75

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

One-month horizon: Top market correlation

Industry	$R^2_{IS}(\%)$	Unconstrained $R^2_{OS}(\%)$		Constrained $R^2_{OS}(\%)$	
		120m	180m	120m	180m
Market	0.80	0.43**	0.51**	0.83***	1.00***
BusSv	0.95	0.82***	0.78**	1.29***	1.39***
Fin	0.48	-0.18	-0.34	0.58***	0.50**
ElcEq	0.27	-0.49	-0.55	0.01	-0.08
Mach	-0.09	-0.56	-0.59	-0.01	0.06
Whlsl	0.29	-0.54	-1.53	0.94***	0.34*
LabEq	0.58	-0.27	-0.34	0.67***	0.77**
BldMt	0.06	-0.29	-0.36	0.36**	0.41**
Chems	0.01	-0.54	-0.61	0.30**	0.32*
Chips	1.37	0.51**	0.52**	0.72***	0.73**
Books	1.03	0.46**	0.38*	0.36**	0.25*
Rtail	0.83	-0.34	-0.52	0.73***	0.66**
Trans	0.05	-0.60	-0.82	0.51**	0.50**
Rubbr	0.45	-0.17	-0.45	0.79***	0.67**

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, based on the critical value derived by Mccracken (2007).

One-month horizon: Bottom market correlation

Industry	$R^2_{IS}(\%)$	Unconstrained $R^2_{OS}(\%)$		Constrained $R^2_{OS}(\%)$	
		120m	180m	120m	180m
Ships	-0.18	-0.57	-0.77	-0.05	-0.11
FabPr	-0.03	-0.39	-0.37	0.20*	0.28
Mines	0.01	-0.35	-0.34	-0.21	-0.18
Oil	0.08	-0.65	-0.59	-0.64	-0.59
Food	-0.02	-1.04	-1.59	0.00	-0.23
Hlth	-0.12	-0.63	-0.80	-0.24	-0.31
Beer	0.40	-0.18	-0.07	0.33**	0.56**
Agric	-0.19	-0.52	-0.72	-0.12	-0.23
Soda	0.30	-0.54	-1.03	0.66***	0.29*
Guns	-0.17	-0.71	-1.02	0.17*	0.06
Util	-0.18	-0.95	-1.16	-0.77	-0.94
Coal	0.55	0.09	0.12	0.34**	0.32*
Smoke	0.16	-0.46	-0.51	-0.45	-0.50
Gold	-0.18	-0.56	-0.58	-0.07	-0.03

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, based on the critical value derived by McCracken (2007).

GP-based & buy-and-hold strategy

- How much can investor gain trading based on GP?
- Follow Campbell & Thompson (2008)
 - Re-estimate returns by GP (in-sample 1975 to 1984)
 - Create out-of-sample strategy with the weight of risky asset

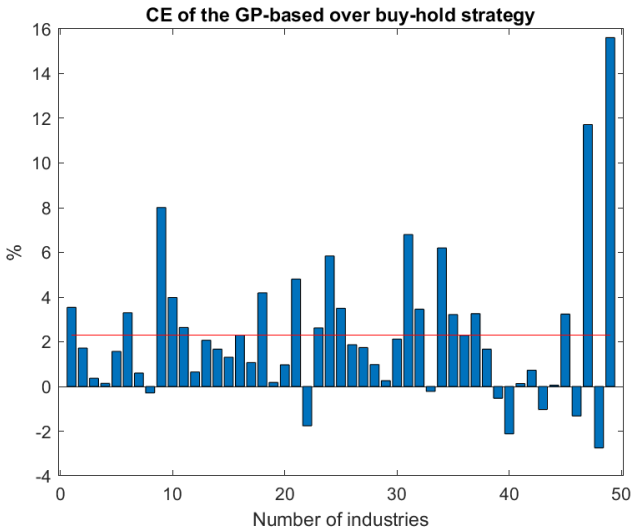
$$w_t = \frac{\hat{r}_{t+1} - rf_{t+1}}{\gamma \hat{\sigma}_t^2}, \gamma = 3 \text{ is the relative risk aversion}$$

- Certainty equivalent return (CE)

$$CE = \bar{r}_{GP} - \bar{r}_B + \frac{\gamma}{2}(\sigma_B^2 - \sigma_{GP}^2)$$

Economic significance

GP-based & buy-and-hold strategy (120m window)



Summary of the findings

- GP has ability to predict returns at the industry level.
- GP strongly predicts stock returns in cyclical industries, but not in defensive industries.
- The OOS forecast by GP is weak, but economically meaningful for mean-variance investors.
- At one-month horizon, GP-based strategy generates an annualized CE of **2.3%** higher than the buy-and-hold across all sectors.

Selected References

- Campbell, John Y, and Samuel B Thompson, 2008, Predicting excess stock returns out of sample: Can anything beat the historical average?, *The Review of Financial Studies* 21, 1509-1531.
- Huang, Darien, and Mete Kilic, 2019, Gold, platinum, and expected stock returns, *Journal of Financial Economics* 132, 50-75.
- Johnson, Travis L, 2019, A fresh look at return predictability using a more efficient estimator. *The Review of Asset Pricing Studies*, 9, 1-46.
- Lewellen, Jonathan, 2004, Predicting returns with financial ratios, *Journal of Financial Economics* 74, 209-235.
- Kacperczyk, Marcin, Clemens Sialm, and Lu Zheng, 2005, On the industry concentration of actively managed equity mutual funds, *The Journal of Finance* 60, 1983-2011.
- Stambaugh, Robert F, 1999, Predictive regressions, *Journal of Financial Economics* 54, 375-421.