Measuring Mispricing in the Global Market: A New Perspective

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2019 May, Singapore

Motivation

- **Identifying mispricing in the global market**
  - The core of modern financial theories.
  - Essential to practitioners allocating asset globally.
  - Highly complex in practice.

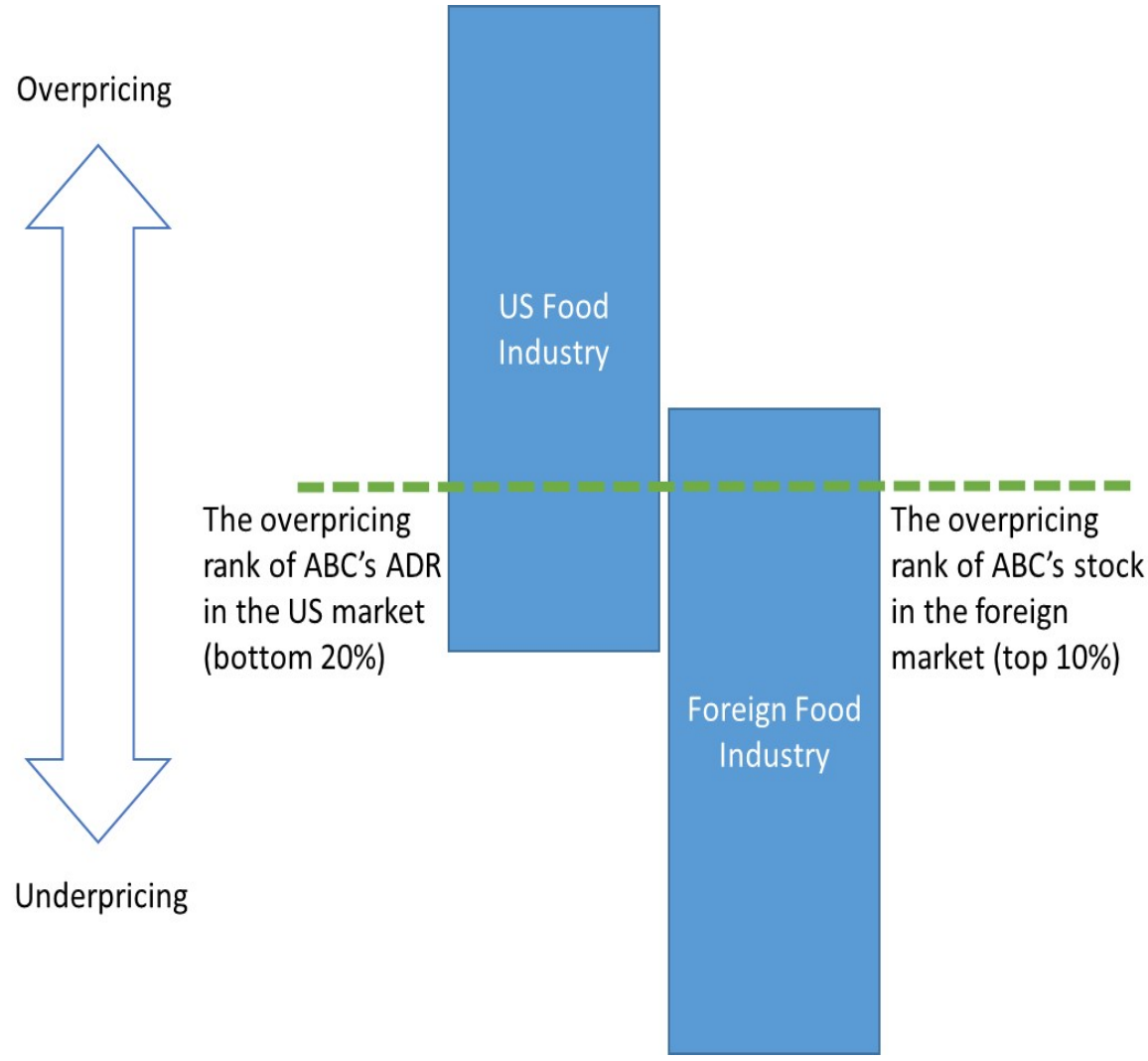
- US market:
  - Englberg, McLean and Pontiff (2018) have examined a list of 97 anomalies observed in the U.S. market that could be related to mispricing due to biased expectations.
  - Hou, Xue, and Zhang (2017) compile a database of 447 anomalies.

- Global market:
  - Local vs global factors: Fama and French, 1998; Griffin, 2002; Bekaert, Hodrick and Zhang, 2009; Hou, Karolyi, and Kho (2011).

A New Perspective

- From U.S. investors' perspective: is the non-US food producer industry mispriced or not compared to its U.S. counterpart?
- Exploit dual-listings as a benchmark to measure cross-market mispricing.
- Assume that only one non-US (Japanese) food company ABC has issued both the parent stock traded in the non-US market (Japan) and American Depository Receipts (ADRs) traded in the U.S.,.
- ABC parent stock and its ADR are probably subject to a similar degree of mispricing thanks to arbitrageurs.

A New Perspective – an example



In Japan: 90% of food stocks is more undervalued than ABC

In the US: 20% of food stocks is more undervalued than ABC

UnderPricing of the Japanese food industry: 90%-20%=70%

A New Perspective – a caveat

- We are not arguing that parent stocks and their ADRs are not mispriced.
- We do not need project mispricing on the anomalies.
- Rather, we only notice that the parent stock versus ADR pair is likely to exhibit the lowest degree of (mis)price divergence among all pairs of non-US versus U.S. food stocks.

Preview

- The UnderPricing index positively predicts industry returns at both quarterly and semiannual frequencies.
- Consistent with the market segmentation argument, we show the differential roles played by foreign and local mutual funds in this sizable return predictability.
  - Dissipation: Foreign mutual funds reshuffle capital into country-industry pairs experiencing undervaluation in the previous period.
  - Formation: Local funds explain the contemporaneous mispricing.

UnderPricing Measure Construction

- **Step one: stock-level mispricing**

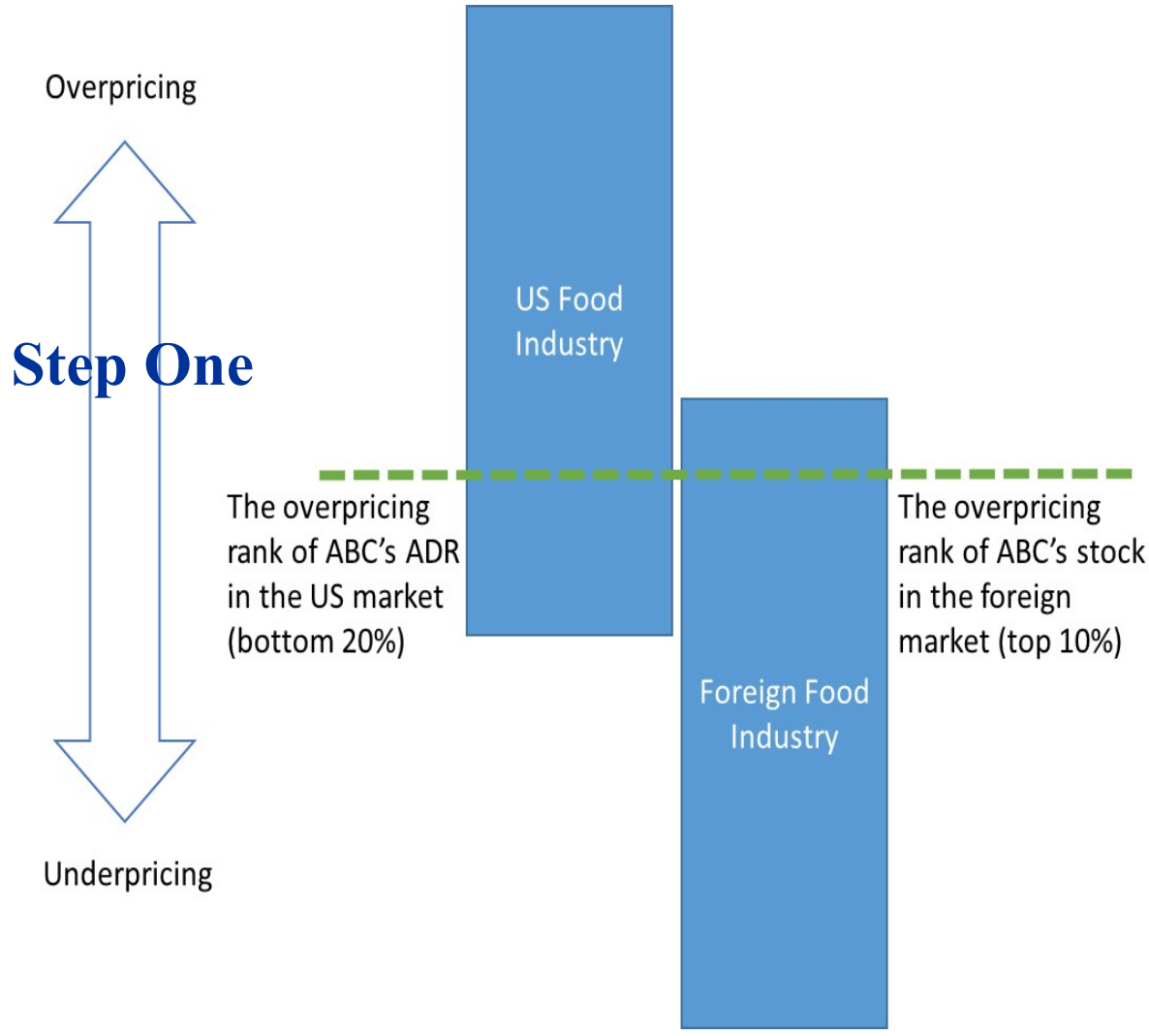
Follow Rhodes-Kropf et al. 2005 to measure the deviation of a firm's market valuation from the one implied by the average industry-quarter specific multiples.

$$logM_{icst} = a_{cst} + \beta 1_{cst} logB_{icst} + \beta 2_{cst} \log(NI)_{icst} + \beta 3_{cst} I_{<0} \log(NI^{+})_{icst} + \beta 4_{cst} \mathrm{LEV}_{icst} + \mathrm{S}_{icst} \quad (1)$$

$$MIS_{icst} = logM_{icst} - \widehat{logM_{icst}} \quad (2)$$

** *i* indexes firms, *c for* countries, *s* for industries, and *t* for time.

Step One – an example



UnderPricing of the foreign food industry: 90%-20%=70%

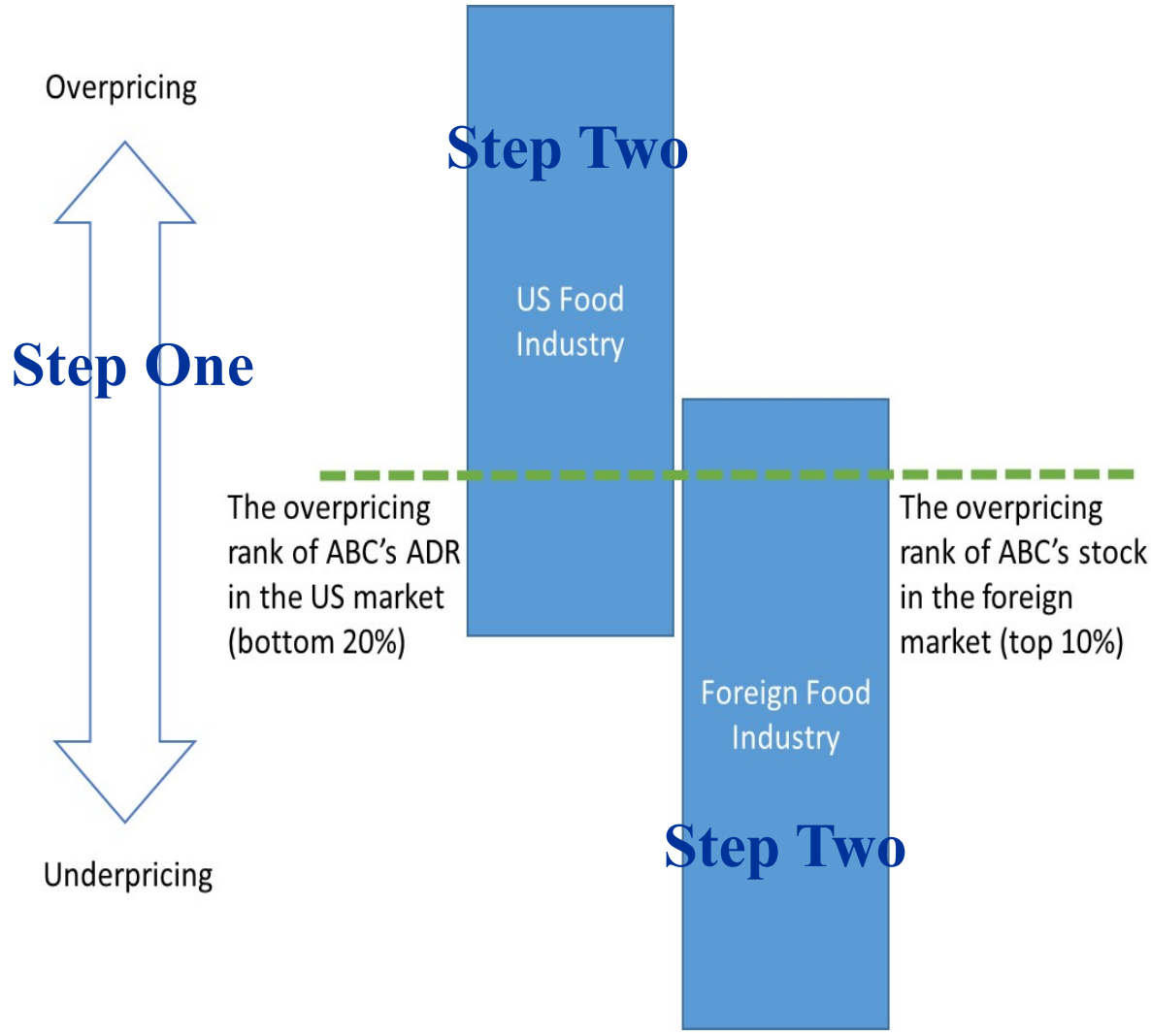
UnderPricing Measure Construction

- **Step two: stock-level mispricing rankings**

Within each country-sector-quarter group, we sort all stocks by MIS_{icst}, and assign to each stock the mispricing ranking scaled by the number of stocks.

Notice that ADRs and their underlying parent firms receive one ranking in the US and one at home.

Step two – an example



UnderPricing of the foreign food industry: 90%-20%=70%

UnderPricing Measure Construction

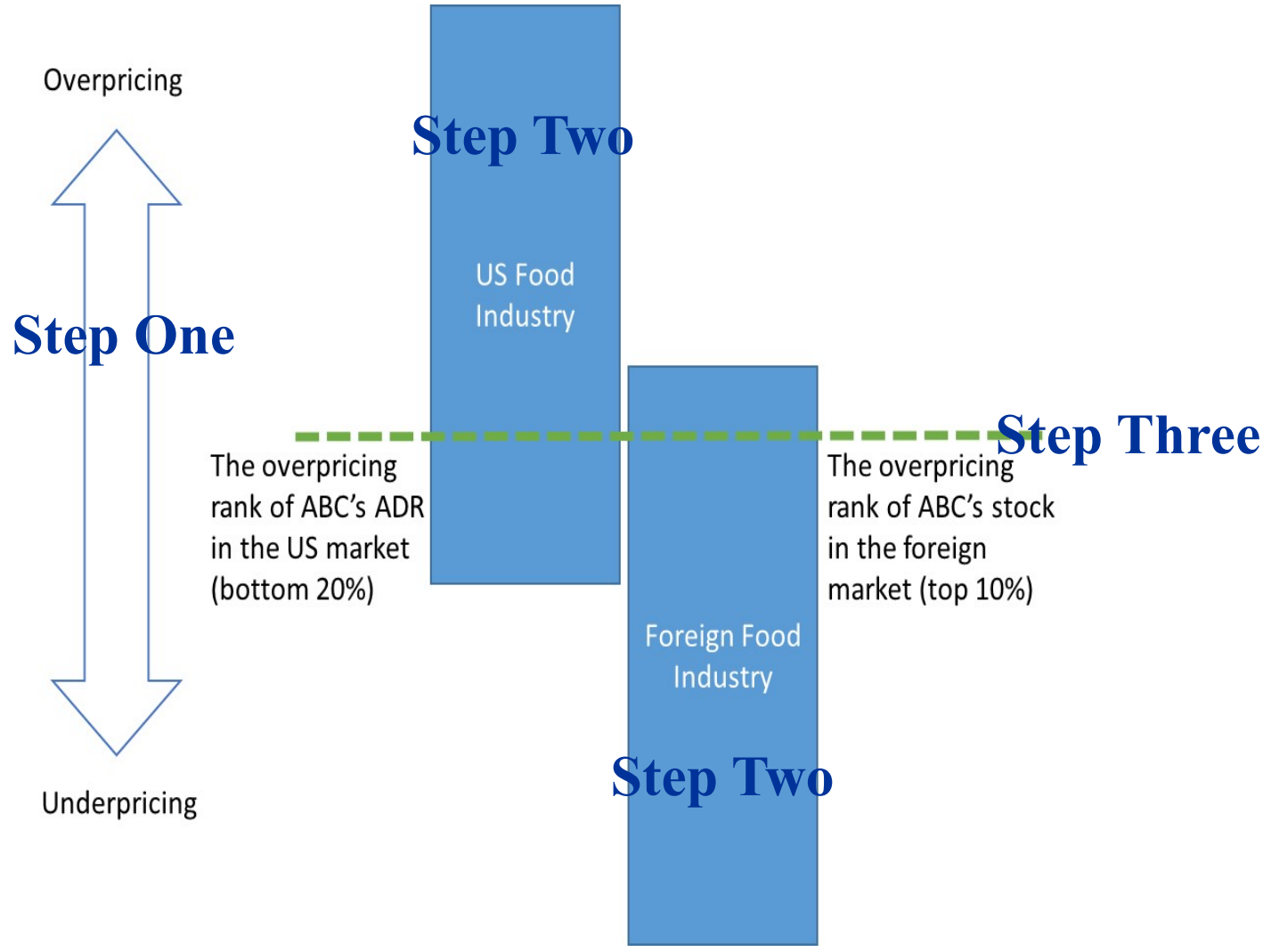
- **Step three: industry-level UnderPricing**

Take the differential of ADR parent stock's relative mispricing ranking and ADR's.

For industries with more than one ADRs (parent stocks), we take the value weighted average rankings across all ADRs (parent stocks).

$$UnderPricing_{sct} = \sum w_{icst} * (RankParent_{icst} - RankADR_{kust}) \quad (3)$$

Step Three – an example



UnderPricing of the foreign food industry: 90%-20%=70%

Sample

- Datastream, Worldscope, Factset/Lionshares and Morningstar International.
- We keep all ADRs and the primary major listing of equity shares with sufficient information to calculate essential financial variables introduced below.
- To ensure the compatibility across countries, we adopt Level 3 of the Global Industry Classification Standard (GICS).
- The sample of 37 industries from 44 countries from December 1999 to December 2012. 477 country-industry pairs. 2045 ADRs.

Summary Statistics

Table 1

Panel A: Quarterly								
	count	mean	sd	min	p25	p50	p75	max
UnderPricing	14414	0.049	0.223	-0.798	-0.045	0.019	0.143	0.997
Returns	14414	0.047	0.174	-0.585	-0.051	0.040	0.134	1.151
GlobalDGTW	14414	-0.004	0.122	-0.318	-0.075	-0.008	0.060	0.398
LocalDGTW	14414	-0.014	0.126	-0.331	-0.088	-0.019	0.053	0.402
Size(log$)	14414	6.575	3.231	0.072	4.245	7.230	9.029	12.346
BM	14414	1.548	2.307	0.140	0.474	0.745	1.195	9.791
Capex	14414	0.044	0.042	0.000	0.014	0.033	0.059	0.223
Leverage	14414	0.208	0.150	0.001	0.078	0.192	0.313	0.639

Panel B: Semiannually								
	count	mean	sd	min	p25	p50	p75	max
UnderPricing	7133	0.049	0.221	-0.798	-0.045	0.021	0.143	0.997
Returns	7133	0.098	0.262	-0.728	-0.053	0.081	0.229	1.772
GlobalDGTW	7133	-0.010	0.185	-0.464	-0.118	-0.019	0.081	0.618
LocalDGTW	7133	-0.028	0.191	-0.511	-0.139	-0.039	0.067	0.635
Flow	4626	0.083	0.375	-1.078	-0.041	0.034	0.164	1.808
FlowFrn	4626	0.205	0.761	-1.079	-0.035	0.055	0.225	5.519
FlowHome	4626	1.076	5.050	-1.141	-0.109	0.030	0.338	40.221
Size(log$)	7133	6.601	3.236	0.068	4.294	7.261	9.051	12.377
BM	7133	1.561	2.373	0.138	0.471	0.740	1.187	10.104
Capex	7133	0.044	0.042	0.000	0.014	0.033	0.059	0.223
Leverage	7133	0.208	0.150	0.001	0.078	0.193	0.314	0.639

Return Predictability – Multivariant

- Gross returns (*Returns*), returns adjusted for global characteristics (*GlobalDGTW*), and returns adjusted for local characteristics (*LocalDGTW)*.

- $Return_{t+1} = a + \beta UnderPricing_t + \gamma_0 Return_t + \gamma_1 Size_t + \gamma_2 Leverage_t + \gamma_3 BM_t + \gamma_4 Capex_t + s_t$ (4)

- Panel and Fama-Macbeth regressions.

Table 2

Panel A : Global DGTW-adjusted Returns and UnderPricing Index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	$GlobalDGTW_{t+1}$	$GlobalDGTW_{t+1}$	$GlobalDGTW_{t+1}$	$GlobalDGTW_{t+1}$	$GlobalDGTW_{t+1}$	$GlobalDGTW_{t+1}$	$GlobalDGTW_{t+1}$
$UnderPricing_t$	0.020**	0.021**	0.023***	0.020***	0.021***	0.023***	0.018**
	(3.06)	(3.07)	(3.43)	(3.39)	(3.60)	(3.81)	(2.76)
$GlobalDGTW_t$	0.034***	0.028**	0.025**	0.034**	0.028**	0.025**	0.040**
	(3.69)	(2.97)	(2.58)	(3.27)	(2.73)	(2.31)	(2.79)
$Size_t$	0.001**	0.001	0.001**	0.001**	0.001	0.001**	0.001*
	(2.91)	(1.58)	(2.41)	(2.23)	(1.13)	(2.17)	(2.00)
BM_t	0.001	-0.002	0.007	0.001	-0.002	0.007	0.003
	(0.19)	(-0.29)	(0.98)	(0.21)	(-0.32)	(1.08)	(0.38)
$Capex_t$	0.073*	0.070*	0.038	0.073***	0.070***	0.038*	0.022
	(1.74)	(1.79)	(1.01)	(3.55)	(3.87)	(1.96)	(0.54)
$Leverage_t$	-0.053***	-0.047***	-0.050***	-0.053***	-0.047***	-0.050***	-0.039**
	(-4.80)	(-5.20)	(-4.25)	(-5.31)	(-5.45)	(-4.61)	(-2.35)
FE Time	Y	Y	Y	Y	Y	Y	
FE Industry	N	Y	N	N	Y	N	
FE Country	N	N	Y	N	N	Y	
Clustering Time	Y	Y	Y	N	N	N	
Clustering Industry	N	N	N	Y	Y	Y	
Clustering Country	Y	Y	Y	N	N	N	

Panel B : Local DGTW-adjusted Returns and UnderPricing Index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	$LocalDGTW_{t+1}$	$LocalDGTW_{t+1}$	$LocalDGTW_{t+1}$	$LocalDGTW_{t+1}$	$LocalDGTW_{t+1}$	$LocalDGTW_{t+1}$	$LocalDGTW_{t+1}$
$UnderPricing_t$	0.032***	0.033***	0.032***	0.032***	0.033***	0.032***	0.030***
	(4.50)	(4.60)	(4.77)	(5.22)	(5.56)	(5.72)	(4.36)

one standard deviation higher *UnderPricing* index is associated with 46.2 (74.8) bps higher global DGTW-adjusted returns (local DGTW-adjusted returns).

Return Predictability – Portfolio

Each quarter, we form zero-investment portfolios which go long in country-industry pairs with top 20% values for *UnderPricing* while shorting those with bottom 20% values.

Table 5

	Raw Return		GlobalDGTW Return		LocalDGTW Return	
Qintile	mean	t	mean	t	mean	t
	Panel A: Equal Weighted					
1	0.028	1.972	-0.013	-2.966	-0.024	-4.823
2	0.033	2.347	-0.006	-2.371	-0.018	-5.61
3	0.031	2.172	-0.009	-2.704	-0.019	-5.356
4	0.047	3.096	0.002	0.491	-0.006	-1.106
5	0.052	3.291	-0.001	-0.221	-0.003	-0.744
5 - 1	0.024	11.659	0.012	6.144	0.020	9.759
	Panel B: Value Weighted					
1	0.026	1.91	-0.012	-2.966	-0.024	-5.019
2	0.034	2.505	-0.005	-1.518	-0.015	-3.861
3	0.029	2.078	-0.009	-2.453	-0.02	-5.059
4	0.045	2.997	0.003	0.604	-0.007	-1.443
5	0.05	3.221	-0.001	-0.17	-0.004	-0.987
5 - 1	0.024	11.272	0.011	6.001	0.020	9.559

Return Predictability – Portfolio

Table 4

	(1) *PortEW*	(2) *PortEW*	(3) *PortEW*	(4) *PortEW*	(5) *PortVW*	(6) *PortVW*	(7) *PortVW*	(8) *PortVW*
$RmRf_t^G$	-0.001	0.003			-0.002	0.002		
	(-0.53)	(0.63)			(-0.81)	(0.38)		
SMB_t^G	0.281**	0.266**			0.284**	0.271**		
	(2.46)	(2.31)			(2.45)	(2.30)		
HML_t^G	0.022	-0.007			0.044	0.020		
	(0.26)	(-0.07)			(0.52)	(0.22)		
WML_t^G		-0.050				-0.044		
		(-0.97)				(-0.83)		
$RmRf_t^L$			0.126**	0.099**			0.130**	0.100**
			(3.21)	(2.38)			(3.27)	(2.40)
SMB_t^L			0.301**	0.345**			0.322**	0.369**
			(2.28)	(2.63)			(2.42)	(2.80)
HNL_t^L			0.184*	0.158			0.233**	0.205**
			(1.83)	(1.59)			(2.30)	(2.05)
MOM_t^L				-0.108*				-0.115*
				(-1.82)				(-1.93)
Alpha	0.020***	0.024***	0.017**	0.020***	0.019***	0.022***	0.015**	0.019***
	(4.15)	(3.95)	(3.34)	(3.85)	(3.85)	(3.61)	(3.00)	(3.57)
Obs	55	55	55	55	55	55	55	55
R^2	0.1	0.186	0.237	0.284	0.184	0.195	0.260	0.312

The equal-weighted hedging portfolio earns global/local Fama-French 3/4 factors adjusted alphas of 2% / 2.4% /1.7% /2% per quarter.

Flows Chasing UnderPricing

- we construct mutual fund flows as the market capitalization changes of total shares held by all mutual funds, adjusted for the gross returns.

$$Flow_t = \frac{cmv_t}{cmw_{t-1}} - Return_t$$

- we further decompose flows into the foreign and domestic components, based on the headquarter locations of the mutual funds.

Flows Chasing UnderPricing

Table 6

Panel B : Flow from mutual funds in foreign countries

	(1) $FlowFrn_{t+1}$	(2) $FlowFrn_{t+1}$	(3) $FlowFrn_{t+1}$	(4) $FlowFrn_{t+1}$	(5) $FlowFrn_{t+1}$	(6) $FlowFrn_{t+1}$
$UnderPricing_t$	0.104**	0.086**	0.088**	0.104**	0.086	0.088*
	(3.23)	(2.52)	(2.31)	(2.09)	(1.62)	(1.88)
$FlowFrn_t$	0.044**	0.037**	0.028*	0.044**	0.037**	0.028
	(2.57)	(2.34)	(1.86)	(2.54)	(2.20)	(1.65)

Panel C : Flow from mutual funds in the home country

	(1) $FlowHome_{t+1}$	(2) $FlowHome_{t+1}$	(3) $FlowHome_{t+1}$	(4) $FlowHome_{t+1}$	(5) $FlowHome_{t+1}$	(6) $FlowHome_{t+1}$
$UnderPricing_t$	0.254	0.225	0.103	0.254	0.225	0.103
	(0.92)	(0.96)	(0.32)	(0.81)	(0.81)	(0.29)
$FlowHome_t$	0.012	0.004	-0.018	0.012	0.004	-0.018
	(0.57)	(0.19)	(-1.14)	(0.61)	(0.20)	(-1.06)
FE Time	Y	Y	Y	Y	Y	Y
FE Industry	N	Y	N	N	Y	N
FE Country	N	N	Y	N	N	Y

Mutual funds headquarterd outside the country in question chase the UnderPricing, but domestic ones don't.

One standard deviation higher *UnderPricing* index is associated with 2.3% higher foreign flows.

UnderPricing Formation

- Why is there UnderPricing to begin with?
- Price pressure from local fund flows?
- Suggestive evidence :

Table 7

	(1) $\Delta UnderPricing_t$	(2) $\Delta UnderPricing_t$	(3) $\Delta UnderPricing_t$	(4) $\Delta UnderPricing_t$	(5) $\Delta UnderPricing_t$	(6) $\Delta UnderPricing_t$
$\Delta FlowHome_t$	-0.001**	-0.001**	-0.001**	-0.000	-0.000	-0.000
	(-2.08)	(-2.04)	(-2.37)	(-0.63)	(-0.62)	(-0.69)
$Ka*\Delta FlowH_t$				-0.003**	-0.003**	-0.003**
				(-2.11)	(-2.06)	(-2.19)
Ka_t				0.008	0.008	0.015
				(0.65)	(0.63)	(0.39)
$\Delta FlowFrn_t$	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004
	(-0.99)	(-0.99)	(-1.02)	(-0.97)	(-0.97)	(-0.99)

Contemporaneously, higher domestic flow increases are correlated with lower underpricing (changes), particularly when local market has stricter capital controls in place.

Conclusion

- **Identifying mispricing in the global market**
  - We propose a novel way to measure cross-market mispricing based on the benchmark of dual listings.
  - We characterize its return predictability, implications on funds, and formation.
  - We show the role of market segmentation in the underpricing.