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Long-run performance of global versus domestic initial public offerings

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Abstract

This paper investigates the long-run performance of global IPOs as compared to purely domestic ones made by US industrial companies. We find that global IPOs not only underperform the market but also underperform their domestic counterparts in the three years after issuance. Moreover, global issues with a larger global tranche are more prone to long-run underperformance. The results are consistent with the window of opportunity hypothesis that investors are overly optimistic about the future prospects of firms engaging in global offerings, and underperformance occurs as unduly high expectations are corrected over time.

JEL classification: G15

Keywords: Global IPOs; Underperformance; Window of Opportunity

1. Introduction

This paper investigates the long-run performance of global IPOs as compared to purely domestic ones made by US industrial firms. Since the mid 1980s, an increasing number of US companies have gone public through global equity offerings in which they set aside a proportion of the total shares to be offered to the global tranche that is reserved

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exclusively for overseas investors. The remaining shares are issued simultaneously in the US domestic market at the same offer price. Since a firm can choose between a purely domestic offer and a global one, original shareholders are naturally motivated to choose the most suitable offering mechanism that maximizes issue proceeds. Whether or not and when to opt for global offerings during the IPO process becomes an important and significant decision to corporate finance executives.

Despite its increasing popularity, there are very limited studies about going public through global offerings. Wu and Kwok (2003) are the first to examine the economic impact of global IPOs by focusing on the short-run impact at the time of offer. They find that global IPOs are significantly less underpriced than what would have been had the offers been limited to domestic only. They attribute the lower initial returns associated with global IPOs to the existence of a foreign clientele that are willing to pay higher prices in exchange for the benefit and convenience of global diversification provided by these offers. They conclude that global issuing companies are able to take advantage of the window of opportunity that occurs when foreign demand for US shares is high.

The notion that there exists a window of opportunity for new equity issues is not new. To explain the long-run underperformance of firms following new equity issues, Ritter (1991) and Loughran and Ritter (1995) conjecture that investors are periodically overoptimistic about the earnings potential of young growth companies, which are representative of newly public companies. It is the correction of investors' unduly optimistic expectations of future prospects that causes newly listed companies to underperform the market in the long run. More recent studies try to offer explanations for such over-optimism. Teoh et al. (1998), for example, provide evidence that IPO firms engage in earnings management by using aggressive accounting schemes before going public. If investors are unaware that earnings are inflated at the time of the offering, they could pay too high a price. Investors may also become overoptimistic because of analysts' misleading recommendations for new issues. Rajan and Servaes (1997), for example, find that analysts are overoptimistic about the earnings potential and long-term growth prospects of recent IPOs. It is not quite clear whether these analysts truly believe in the growth prospects or they knowingly provide biased recommendations just to promote the issues.

In line with the window of opportunity hypothesis, we propose in this paper that global issues are more prone to investor over-optimism than purely domestic ones. Foreign investors' interest in US shares is not only affected by the fundamentals of the IPO firm, but also affected by other factors such as the attractiveness of the US stock market relative to their national markets, convenience of share ownership, and the desire for global diversification. There may exist a window of opportunity where foreign investors are willing to pay a higher price for US shares in exchange for the benefit and convenience of global diversification provided by global offerings. For instance, Brennan and Cao (1997) demonstrate that under certain circumstances investors tend to purchase foreign assets in periods when the return on foreign assets is high. Wu and Kwok (2003) find that US companies are more likely to choose global offerings and, once they choose to do so, allocate more shares into the global tranche when the US stock market performs better relative to other major markets.

In terms of convenience of share ownership, while it is generally true that foreign investors are not restricted from purchasing US shares directly in the US market, global offerings may reduce the deadweight cost such as information acquisition cost that foreign investors have to pay to learn about US shares before they can invest in them. More

importantly, foreign investors' access to the primary market for regular domestic IPOs is quite limited because underwriters have tight control over the allocations of IPO shares. Underwriters not only control who get shares, but also how many shares in the aggregate are allocated. There is no secret that their regular clients receive preferential treatment. Though we have no knowledge of their regular client base, it is reasonable to assume that these regular investors are mostly domestic.[2] In a global offering, a sizeable portion of the total shares to be offered are put aside in the global tranche, which is reserved exclusively for overseas investors.

Since a US IPO firm can choose between a pure domestic offer and a global offer, it is very likely that it will choose global over domestic when foreign demand for its shares is high. In other words, overseas enthusiasm for its shares may prompt the firm to add a global tranche when going public. In addition, global issuers employ two separate syndicates of underwriters: one for the domestic tranche and another for the global tranche. Since each member of the underwriting syndicates has its own regular investor clienteles and may specialize by geographic region, global offerings will attract more investors to participate in the primary market. Moreover, underwriters and senior managers of the IPO firm usually conduct road shows abroad first before they return to US to present the issue to domestic investors. Positive feedback from abroad can affect the reception in domestic market in the sense of Welch (1992). This cascade effect is important since the majority of the shares are offered in the US domestic market.

In short, IPO firms can switch from one offering mechanism to another to take advantage of temporary swings of investor sentiments regarding their future prospects. They will more likely choose global offerings over domestic when foreign demand for US shares is high.

We test the implications of the window of opportunity hypothesis by employing a comprehensive sample of initial public offerings made by US industrial companies between 1986 and 1997. Based on the Fama–French factor model regression results of calendar monthly portfolio returns, global IPOs significantly underperform their risk adjusted benchmarks. In cross-sectional examinations, global IPO firms underperform their purely domestic counterparts in the three years after issuance. Within the global sample, issues with a larger global tranche are more prone to long-run return shortfall than others. In fact, the overall result that global IPOs underperform is primarily driven by those with a larger global tranche.

Despite the long-run return shortfall, however, global issuers fare relatively better in terms of operating performance during the same time period, although both global and domestic issuers on average experience deteriorating operating performance. The fact that global issuers have better operating performance but lower stock returns can best be explained as being consistent with unduly high expectations of the future prospects for global issuers.

Overall, these results are consistent with the view that investors overreact to global offerings in anticipation of unduly high expectations of the future prospects of these issuers. Optimistic investors systematically bid up the price above its long-run value of the issue, and underperformance occurs as disappointing operating performance unfolds over time.

[2] Hanley and Wilhelm (1995) investigate the initial allocations of 38 IPOs managed or co-managed by a single underwriter during the 1983–1988 period. They find that domestic institutional investors receive 50.3% of the total shares while foreign institutional investors receive 16.6%.

The remainder of the paper proceeds as follows. Section 2 describes our samples of IPO firms. Section 3 presents the empirical results of long-run returns. Section 4 explores potential sources of performance differences between global and domestic IPOs. Section 5 summarizes and concludes.

2. Data and sample selection procedure

We use the Securities Data Company's (SDC) New Issues database to collect the complete sample of global and purely domestic initial public offerings of common stock made by US companies from 1986 to 1997.

Table 1
Distribution of sample firms by calendar year and firm size

Year	Global IPOs	Domestic IPOs	Total
Panel A: Distribution of sample IPOs by calendar year			
1986	12	162	174
1987	31	94	125
1988	18	36	54
1989	22	45	67
1990	19	54	73
1991	49	157	206
1992	64	193	257
1993	63	271	334
1994	47	213	260
1995	51	251	302
1996	73	402	475
1997	47	315	362
Total	496	2193	2689

Firm size decile	Global IPOs		Domestic IPOs	
	N	% of Sample	*N*	% of Sample
Panel B: Distribution of sample IPOs across firm size deciles				
1 (Smallest)	3	0.6	266	12.1
2	11	2.2	258	17.7
3	10	2.0	259	11.8
4	9	1.8	260	11.9
5	22	4.4	247	10.8
6	33	6.7	236	10.1
7	48	9.7	221	9.6
8	58	11.7	211	10.0
9	105	21.2	164	7.5
10 (Largest)	197	39.7	71	3.2
Total	496	100.0	2193	100.0
Mean firm size ($mil)	583.48		129.73	
Mean offer size ($mil)	167.28		31.71	

This table contains global and purely domestic initial public offerings (IPOs) of common stock made by US industrial companies from 1986 to 1997. Data are obtained from the Securities Data Company's New Issues database. Panel A reports sample distributions by calendar year. In Panel B, ten firm size deciles are formed using the combined sample. *N* denotes the number of IPOs in each size decile. Firm size is the market capitalization calculated at the offer price. Offer size is the gross proceeds from the issue, including both the domestic and the global tranches.

We exclude issues with offer prices equal to or below $5 or market capitalization equal to or less than $20 million. Also excluded are unit and rights offers, issues made by financial institutions (SIC 60-67), regulated electricity and gas utilities companies (SIC 491-494), closed-end funds, and real estate investment trusts (REITs). To be included in our sample, the issuers must be available on the University of Chicago Center for Research in Security Prices (CRSP) tapes on the offering dates.

The final global sample contains 496 IPOs while the domestic sample consists of 2193 issues. The distribution of sample firms by calendar years is presented in Panel A of Table 1. The number of global offers varies over time but generally has increased significantly in the 1990s.

In Panel B of the table, we pool the two samples and categorize them into firm size deciles. Firm size is measured as the post-offer total number of shares outstanding times the offer price. The results indicate that our global IPO sample is tilted toward larger firms relative to the domestic sample. For example, 60.9% (or 302 issues) of the global sample belong to the two largest size deciles, while only 2.8% (or 14 issues) belong to the two smallest size deciles. The average firm size is $583.48 million for global issuers, more than four times larger than that of domestic issuers ($129.73 million). The mean offer size, measured as the gross proceeds from the issue, is $167.28 million for global issues, compared to only $31.71 million for purely domestic offers.

3. Empirical results of long-run returns

This section provides our empirical results. We use three measures to gauge the long-run returns of newly listed companies. The first is the buy-and-hold return in excess of the market return. This measure has been commonly used in the literature because it precisely measures investor experience. The second is the monthly cumulative abnormal return. The last is the Fama–French multifactor model approach in which the monthly calendar-time return on a portfolio of IPO firms is regressed on three factors.

3.1. Buy-and-hold abnormal returns (BHARs)

We begin our analysis by examining the buy-and-hold abnormal returns, which have become a standard method of measuring long-term returns.[3] The buy-and-hold abnormal return for firm i over the period from T_1 to T_2 is calculated as

$$\mathrm{BHAR}_{(T_1,T_2)} = \left[\prod_{t=T_1}^{T_2}(1+R_{it})\right] - \left[\prod_{t=T_1}^{T_2}(1+R_{mt})\right] \tag{1}$$

[3] Barber and Lyon (1997) and Kothari and Warner (1997) argue that the buy-and-hold return is the appropriate estimator of long-run performance because it precisely measures investor experience. Lyon et al. (1999) also prefer the buy-and-hold approach. However, these studies warn that common estimation procedures can produce biased buy-and-hold estimates. In particular, biases arise from new listings, rebalancing of benchmark portfolios, and skewness of multiyear abnormal returns. Proposed corrections include carefully constructing benchmark portfolios to eliminate known biases and conducting inferences via a bootstrapping procedure, as applied by Ikenberry et al. (1995).

Table 2
Buy-and-hold and cumulative abnormal returns

Long-run return measure	Holding period	Global IPOs ($N = 496$)		Domestic IPOs ($N = 2193$)	
		Equal-weighted	Value-weighted	Equal-weighted	Value-weighted
BHAR	One year	−2.67	−1.68	−4.78	−4.89
	Two years	−9.60	−9.41	−8.77	−0.56
	Three years	−15.41	−14.29	−14.89	1.16
CAR	One year	−1.58	−1.06	−3.94	−4.10
	Two years	−7.81	−5.82	−10.78	−7.27
	Three years	−10.63	−7.79	−11.48	−6.34

This table reports the one-, two-, and three-year buy-and-hold abnormal returns (BHAR) and cumulative abnormal returns (CAR), which are measured as follows:

$$\mathrm{BHAR}_{(T_1,T_2)} = \left[\prod_{t=T_1}^{T_2}(1+R_{it})\right] - \left[\prod_{t=T_1}^{T-2}(1+R_{mt})\right]$$

$$\mathrm{CAR}_{(T_1,T_2)} = \sum_{t=T_1}^{T_2}(R_{it} - R_{mt})$$

where R_{it} is the monthly return for firm i in month t, and R_{mt} is the monthly return on the CRSP value weighted market index. The holding horizon begins with the first calendar month (T_1) after the month in which an IPO is completed. If an issuing firm is delisted prior to the anniversary date of the holding period, we truncate its BHAR and CAR on that date. In other words, T_2 is the earlier of the last month of CRSP-listed trading or the end of the one-, two-, or three-year holding horizon. The equally-weighted and value-weighted averages are calculated for each sample. The weight is the relative market capitalization of the IPO firm. Returns are expressed as percentage.

where R_{it} is the monthly return for firm i in month t, and R_{mt} is the return on the CRSP value weighed market index in the same month. We compute BHARs using monthly return data obtained from the CRSP database.[4] The holding horizon begins with the month after the offer is made (T_1). Following Loughran and Ritter (1995), if an IPO firm is delisted prior to the end of a holding period, we truncate its BHAR till the delisting month. In other words, T_2 is the earlier of the last month of CRSP-listed trading or the ending month of the holding period.[5] For each sample and holding period, we calculate the equally-weighted average BHARs. We also calculate the value-weighted averages, where the weight is the relative market capitalization of an IPO firm in the sample.

The one-, two-, and three-year BHARs are reported in Table 2. When returns are equally weighted, both global and domestic IPO firms underperform the market index up to three years after offer. For an investor buying shares at the end of the offer month and holding them for one, two, and three years, global IPOs on average trail the market by 2.67%, 9.60%, and 15.41%, respectively. In comparison, during the same periods domestic IPO firms underperform the CRSP value-weighted market index by 4.78%, 8.77%, and 14.89%. These results are generally consistent with the well accepted fact of long-run underperformance for newly listed companies.

[4] Excluding the issuing month does not affect our results. We also calculate the buy-and-hold returns using daily return data starting from the first trading day, and the results are not materially affected.

[5] An alternative approach is to splice in the return on the value-weighted CRSP market index for the months after a firm is delisted through the end of the one-, two-, or three-year holding period. Both approaches adjust for potential survivorship bias. The results are very close, and our major conclusions remain intact.

When value weighted, global IPOs underperform the market by 1.68%, 9.41%, and 14.29% for the one-, two-, and three-year holding periods. While value weighting has little impact on the results for the global sample, it substantially reduces the extent of negative abnormal returns for domestic IPOs for the two- and three-year holding periods. In two years after offer, the value-weighted average BHAR is only −0.56% for purely domestic IPOs. The figure turns slightly positive at 1.16% for domestic IPOs during the three-year holding period.

The result that value weighting reduces the degree of long-run underperformance for domestic IPOs is probably due to the fact that, in general, IPOs are strongly tilted towards small growth firms, and this group has been the worst-performing style category of the last several decades (Brav and Gompers, 1997). On the other hand, we have shown in Table 1 that the global IPOs are much larger in size than their domestic counterparts.[6]

3.2. Cumulative abnormal returns (CARs)

In this section we calculate abnormal performance using the cumulative abnormal return approach. As Fama (1998) and Mitchell and Stafford (2000) argue, CARs may be a better, less biased method to gauge long-run returns. In addition to the problem caused by skewed distributions associated with BHARs that makes statistical inferences difficult, the BHAR method can also magnify underperformance – even if it occurs in only a single period – as a consequence of compounding single-period returns. CARs can eliminate the compounding effect of a single period's abnormal performance associated with BHARs.[7] CARs are calculated as follows:

$$\mathrm{CAR}_{(T_1,T_2)} = \sum_{t=T_1}^{T_2} (R_{it} - R_{mt}) \tag{2}$$

where R_{it} is the monthly return for firm i in month t, and R_{mt} is the monthly return on the CRSP value weighted market index. To be consistent with BHARs, the holding horizon begins with the first calendar month (T_1) after the month in which an IPO is completed. If an issuing firm is delisted prior to the anniversary date of the holding period, we truncate its CAR on that date. Both equally-weighted and value-weighted averages are calculated for each sample.

[6] In a previous draft, we match each global IPO with a domestic offer by firm size in the following procedure. For each global IPO made in year t, we identify all purely domestic issues made in the same year. Limiting IPOs to a single year allows for greater homogeneity in issuance conditions. From this set we select the firm that has a market capitalization closest to that of the global issue to be matched. A domestic IPO cannot be selected more than once into the size-matched control sample. Since we intend to match each global offer with a domestic one, despite our best efforts, the average firm size of the matching domestic IPOs is still lower (about 50%) than that of global issuers. The results indicate that performance difference between global IPOs and their size-matched domestic counterparts are more pronounced.

[7] It needs to be pointed out that CARs have their own unique problems. That is, CARs tend to increase returns. As an illustration, consider two periods in which an IPO firm's stock declines from \$100 to \$1 in the first period (a return of −99%) and bounces back to \$10 in the next period (a return of 900%). The buy-and-hold return is $(1 - 99\%)(1 + 900\%) - 1 = -90\%$. The cumulative return, however, is $-99\% + 900\% = +801\%$. CARs can substantially overstate returns when underperforming IPOs experience temporary jumps. This occurs because the maximum negative return is −100% in any single period while there is no limit for positive returns.

The results, also reported in Table 2, indicate that the equally weighted one-, two-, and three-year CARs for global issuers are, respectively, −1.58%, −7.81% and −10.63%, compared to −3.94%, −10.78%, and −11.48% for domestic issuers. Like the case for BHARs, value weighting tends to increase returns or reduce the degree of underperformance. But the impact is more pronounced for domestic IPOs. Specifically, the value-weighted one-, two-, and three-year CARs are, respectively, −1.06%, −5.82%, and −7.79% for global IPO firms, compared to −4.10%, −7.27%, and −6.34% for domestic IPOs.

As return measures, both BHAR and CAR calculations in event time suffer from cross-sectional correlation. Put another way, if there are common shocks in the returns of IPO firms, the *t*-statistics in event-time tests will be overstated. For instance, test statistics calculated from BHARs are misspecified due to the severe skewness of the distribution of the BHARs in most studies. The skewness problem is usually corrected by a bootstrapping method (for example, Ikenberry et al., 1995). However, bootstrapping does not address the issue of cross-sectional correlation when the returns on individual IPOs overlap, as they do when multi-year buy-and-hold returns are used.

Owing to the weakness of statistical tests mentioned above, at this junction we do not engage in any statistical inferences on the performance difference between the two types of IPOs. In the following sections, we provide more parsimonious tests of the return difference between global and domestic IPOs.

3.3. CAPM and Fama–French three-factor regressions

Fama (1998) and Mitchell and Stafford (2000) strongly advocate a monthly calendar-time portfolio approach for measuring long-term abnormal performance. First, monthly returns are less susceptible to the bad asset pricing model problem. Second, by forming monthly calendar-time portfolios, all cross-correlations of event-firm abnormal returns are automatically accounted for in the portfolio variance. Finally, the distribution of this estimator is better approximated by the normal distribution, allowing for classical statistical inference.

For each calendar month we form a equally-weighted portfolio for each of the global and domestic samples. The returns of the portfolio are used to estimate the Fama–French three-factor model as follows:

$$R_t - R_{ft} = \alpha + \beta(R_{mt} - R_{ft}) + s\mathrm{SMB}_t + h\mathrm{HML}_t + \varepsilon \tag{3}$$

where R_t is the calendar-time portfolio return for each sample in month t and R_{ft} is the riskfree return in the same month. The three Fama–French factors are the excess return on the market portfolio ($R_{mt} - R_{ft}$), the difference in the returns of value-weighted portfolios of small stocks and large stocks (SMB_t), and the difference in returns of value-weighted portfolios of high book-to-market stocks and low book-to-market stocks (HML_t). When the last two factors are excluded, this model becomes the market model or CAPM.

The coefficient estimate of the intercept term, α, from the time-series regressions is used as an indicator of risk-adjusted performance for each sample. Given the assumption of normality of the residuals, statistical inferences can be made by checking the *t*-statistics of the intercepts.

The ordinary least squares (OLS) regression results are presented in Panel B of Table 3. For domestic IPOs, the intercept is, though negative, not different from zero in either the

Table 3
Calendar-time portfolio regressions

	Sample			
	Global IPOs		Domestic IPOs	
Panel A: Ordinary least squares				
Intercept	−0.5443 [−2.03]**	−0.3903 [−1.71]*	−0.3773 [−1.03]	−0.0377 [−0.15]
$R_m - R_f$	1.3182 [22.27]***	1.2505 [21.71]***	1.3158 [16.24]***	1.1538 [18.74]***
SMB		0.5449 [7.73]***		0.9895 [12.97]***
HML		0.0274 [0.31]		−0.0765 [−0.79]
Adj. R^2	0.74	0.82	0.60	0.83
Panel A: Weighted least squares				
Intercept	−0.5105 [−2.05]**	−0.3282 [−1.73]*	−0.498 [−1.38]	−0.0858 [−0.39]
$R_m - R_f$	1.285 [21.74]***	1.192 [24.02]***	1.3319 [16.20]***	1.1587 [20.37]***
SMB		0.6727 [10.90]***		1.06 [15.31]***
HML		0.0677 [0.86]		−0.103 [−1.14]
Adj. R^2	0.73	0.85	0.59	0.86

This table presents the regression results of the calendar-time monthly market adjusted abnormal returns using the market model and the Fama and French (1993) three-factor model:

$$R_t - R_{ft} = \alpha + \beta(R_{mt} - R_{ft}) + s\mathrm{SMB}_t + h\mathrm{HML}_t + \varepsilon$$

where R_t is the calendar-time portfolio return for each sample in month t. The three Fama–French factors are the excess return on the market portfolio ($R_{mt} - R_{ft}$), the difference in the returns of value-weighted portfolios of small stocks and large stocks (SMB_t), and the difference in returns of value-weighted portfolios of high book-to-market stocks and low book-to-market stocks (HML_t). In panel A ordinary least squares (OLS) time series regressions are estimated while in panel B the weighted least squares (WLS) regressions are estimated in which the weight is the square root of the number of IPOs in each calendar month. The coefficient estimate of the intercept, α, provides a test of the null hypothesis that the two samples have equal monthly mean returns. The t-statistics are shown in brackets.

* Significant at 10% level.
** Significant at 5% level.
*** Significant at 1% level.

market model or the Fama–French factor model. This result suggests that domestic IPOs do not underperform on a calendar-time risk-adjusted basis, a result consistent with most previous IPO studies adopting this approach.

For global IPOs, however, the intercept terms are significantly negative in both models. In the market model, the intercept is −0.5443 with a t-statistic of −2.03. In the three-factor model, the intercept becomes −0.3903 and is significant at the 10% level. Using the result from the three-factor model, the implied three-year buy-and-hold risk adjusted abnormal return is $(1 - 0.3902\%)^{36} - 1 = -13.22\%$.

Panel B presents the time-series regressions weighted by the square root of the number of IPO firms in the calendar-time portfolio in each month. For domestic IPOs, once again the intercepts in the regressions are, though negative, not different from zero. In contrast, for the global sample the intercepts are significantly negative in both the market model and the Fama–French factor model. The magnitude and significance level of the intercepts are very close to the OLS results. Specifically, the intercept is −0.5105 ($t = -2.05$) in the market model and is −0.3282 ($t = -1.73$) in the factor model.

In sum, over the three years after issuance global IPO firms significantly underperform their benchmarks on a risk-adjusted basis while their domestic counterparts do not.

3.4. Cross-sectional regressions of long-run abnormal returns

This section conducts further test to account for firm and offer characteristics that may attribute to the cross-sectional long-run performance.[8] To this end, we regress the long-run abnormal return on the global offering dummy and a number of control variables as follows:

$$\begin{aligned}\text{Abnormal return} = {} & \alpha + \gamma \text{Global Dummy} + \beta_1 \ln(\text{Firmsize}) \\ & + \beta_2 \text{Price adjustment} + \beta_3 \text{Volatility} + \beta_4 \text{Market runup} \\ & + \beta_5 \text{Rank} + \beta_6 \text{Spinoff} \\ & + \sum_{i=7}^{9} \beta_i \text{Operating performance measure}_i + \varepsilon \end{aligned} \tag{4}$$

We use three long-run abnormal return measures: BHAR, CAR, and the intercept term from the Fama–French regression. These measures are discussed in previous sections.

Global dummy equals one for global issues and zero if otherwise. Firm size is the market capitalization ($ million) calculated at the offer price. Price adjustment is the percentage change of the offer price relative to the midpoint of the filed range. Price adjustment reflects the pre-market demand for the issue. Volatility is measured as the standard deviation (as a decimal) of the first 120 daily returns taken from the CRSP after the offering. Market runup is measured as the cumulative return on the CRSP equally weighted market portfolio from −250 to −2 relative to its average return from −391 to −251 prior to the offer date (day 0). Rank of the lead underwriter used in this article is developed by Carter et al. (1998) and updated by Loughran and Ritter (2004). Carter, Dark, and Singh rank underwriters using the 1980–1991 period and assign the highest rank as 9 and the lowest as 0. For issues made after 1991, we borrow the rankings updated and modified by Loughran and Ritter. All of their rankings they have assigned are integers followed by 0.1 (from 1.1 to 9.1).[9] Spinoff is an indicator variable that equals one if the IPO is a spinoff and 0 if otherwise.

To gauge the operating performance of our sample firms, we compute (1) the ratio of earnings before interest, taxes, depreciation, and amortization to total assets, EBITDA/Assets; (2) the ratio of net income before extraordinary items to total assets, ROA, and (3) the net profit margin, defined as the ratio of net income before extraordinary items to net sales. Accounting data are measured at the end of the fiscal year and are taken from the *Research Insight*.

Due to the skewness of accounting ratios, we use dummy variables to reflect whether or not operating performance improves from the end of the year in which the offer is completed to the end of the holding period. For example, when the holding period is three years, EBITDA/Assets equals one if it is higher at the end of the third year after the offering than it is at the end of the year in which the offer is completed, and zero if otherwise.

[8] Conditional on the Fama and French model being the correct asset pricing model, firm and offer specific variables are presumably unrelated to abnormal returns. However, the asset-pricing literature itself has failed to provide an accepted model of risk adjusted performance against which one can measure long-run post-IPO abnormal return. The benefit of cross-sectional regressions represents an attempt to find variables that correlate with subsequent abnormal returns.

[9] They are available at Ritter's web site: http://bear.cba.ufl.edu/ritter/ipodata.htm.

The OLS regression results are presented in Table 4. In terms of the left-hand dependent variable, the first two regressions use the three-year BHAR, the next two use the three-year CAR, and the last two employ the intercept from the Fama–French factor model regression.

Table 4
Cross-sectional regressions of abnormal returns

Independent variables	Dependent variable					
	Three-year BHAR		Three-year CAR		Intercept from Fama–French factor model	
Intercept	−0.718	−0.964	−0.564	−0.503	−0.496	−0.813
	[−1.63]	[−1.70]*	[−3.16]***	[−2.67]***	[−1.05]	[−1.63]
Global dummy	−0.2868	−0.401	−0.1298	−0.1356	−0.3997	−0.4728
	[−2.10]**	[−2.34]**	[−2.0]**	[−2.0]**	[−2.11]**	[−2.45]**
Ln (firm size)	0.023	−0.013	0.0064	−0.06	0.0022	−0.118
	[0.27]	[−0.13]	[0.21]	[−1.81]*	[0.3]	[−1.32]
Price adjustment	0.0076	−0.0398	−0.082	0.072	−0.1723	0.11
	[0.03]	[−0.12]	[−0.57]	[0.49]	[−0.49]	[0.29]
Volatility	−6.731	−7.30	−1.871	−0.955	−8.875	−1.112
	[−1.91]*	[−1.77]*	[−0.97]	[−0.50]	[−1.67]*	[−0.21]
Domestic	−0.1758	−0.2717	−0.1189	−0.176	−0.095	−0.184
market runup	[−1.66]*	[−2.26]**	[−2.27]**	[−3.21]***	[−0.59]	[−1.14]
Rank	0.0997	0.1125	0.0677	0.07	0.174	0.176
	[4.60]***	[4.84]***	[4.52]***	[4.53]***	[3.95]***	[3.85]***
Spinoff	0.0137	0.0464	0.0324	0.056	−0.021	0.0065
	[1.0]	[0.41]	[0.53]	[0.89]	[−0.11]	[0.04]
EBITDA/Assets		0.213		0.098		0.221
dummy		[1.60]***		[1.57]		[1.29]
Net profit margin		0.468		0.1475		0.399
dummy		[3.49]***		[2.09]**		[2.02]**
ROA dummy		0.589		0.4792		1.19
		[3.72]***		[5.76]***		[5.24]***
Adj. R^2	0.006	0.05	0.01	0.09	0.007	0.074
F-statistic	3.31***	11.4***	5.09***	21.39***	3.79***	17.13***

In this table, we pool the global and domestic samples and regress the three long-run return measures on the global offering dummy that equals one for global issues and zero if otherwise and a set of control variables. The three return measures are the three-year BHAR, CAR, and the intercept term from the Fama–French factor model. Firm size is the market capitalization ($ million) calculated at the offer price. Price adjustment is measured as the offer price adjustment relative to the midpoint of the filed range reported in the preliminary prospectus. Volatility represents the standard deviation (measured as a decimal) of the first 120 daily returns taken from the CRSP after the offering. Domestic market runup is measured as the cumulative return on the equally weighted CRSP market index from −250 to −2 relative to its average from −391 to −251 prior to the offer date. Rank of the lead underwriter is borrowed from Carter et al. (1998) and updated by Loughran and Ritter (2004). Spinoff is an indicator variable that equals one if the IPO is a spin-off and 0 otherwise. Three operating performance measures are used: the ratio of earnings before interest, taxes, depreciation, and amortization (EBITDA) to total assets; (2) the ratio of net income before extraordinary items to total assets, ROA, and (3) the net profit margin, defined as the ratio of net income before extraordinary items to net sales. The operating performance measures are dummies that equal one if they are higher at the end of the holding period than they are at the end of the year in which the offer is completed, and zero if otherwise. The standard errors are corrected for heteroskedasticity using the White's (1980) procedure. T-statistics are in brackets.

* Significant at 10% level.

** Significant at 5% level.

*** Significant at 1% level.

In regressions (1), (3), and (5) operating performance measures are not included. In all regressions, the coefficient of the global dummy variable is negative and is significant at the 5% level, suggesting that global IPOs underperform relative to their domestic counterparts in three years after offer.

When BHAR is used as the dependent variable, the coefficient of the global dummy is −0.2868. When CAR is used as the abnormal return measure, the coefficient of the global dummy is −0.1298. When the abnormal return is measured by the intercept term from the Fama and French model regression, the global dummy has a coefficient of −0.3997. The magnitude of the coefficient in regression (5) implies that global IPOs underperform domestic ones by 13.43% $(=(1-0.3997\%)^{36}-1)$ on a buy-and-hold basis and by 14.39% $(=0.3997\% \times 36)$ on a monthly cumulative basis.

In sum, after firm and offer characteristics are controlled, global offering firms significantly underperform domestic IPO firms. The cross-sectional regression results using different abnormal return measures seem to be comparable in magnitude.

Among the control variables, rank of the lead underwriter is positively and significantly related to long-run abnormal returns. This result holds regardless of which abnormal return measure is used. This is consistent with Carter et al. (1998) that uncover the certification role of prestigious underwriters.

On the other hand, post-offer price volatility is negatively associated with long-run returns. The aftermarket price volatility can be caused by heterogeneous expectations or dispersion in analyst forecasts, both of which are related to the ex-ante uncertainty of an IPO issue. Thus this variable can be used as a proxy for the ex-ante uncertainty of an IPO. The negative coefficient on price volatility is consistent with implications of the Miller (1977) model. Miller assumes that there are constraints on shorting IPOs and that investors have heterogeneous expectations regarding the valuation of a firm. The most optimistic investor buys the IPO. Over time, as the variance of opinions decreases, the marginal investor's valuation will converge towards the mean valuation, and its price will fall. The Miller effect implies that long-run performance is negatively associated with ex-ante uncertainty of the IPO issue. Since the Miller effect is built upon short sales constraints and divergence of opinions, it would be interesting to know where such effect is larger: global or domestic IPOs. In a typical global offering, the majority of shares are offered in the domestic market like an ordinary domestic offering. In this sense, short sales constraints are binding for global offerings as well as for domestic offerings, regardless of what happens to the shares allocated in the global tranche. In terms of divergence of opinions, it should be more so for global IPOs than for purely domestic ones, simply because there are both domestic and foreign investors participating in a global offering. Foreign investors' interest in US shares is not only affected by the fundamentals of the IPO firm, but also affected by other factors such as their desire for global diversification, changes in exchange rates, convenience of share purchases, and the strength of the US stock market. As a result, foreign investors may have quite different views about these US shares.

The strong negative coefficient on the pre-offer market runup implies that offers made at a time when the market is strong are associated with poor post-issue performance. This result can be interpreted as being consistent with the window of opportunity hypothesis, stating that managers try to time the market so that the offer is made when the market condition is most favorable for issuing new equity. Another interpretation of the negative sign on the runup variable is that firms go public when costs of capital decline (e.g., the

equity premium declines). Under this interpretation, the empirical result that the sign of the runup variable is negative need not be inconsistent with market efficiency.

In regressions (2), (4), and (6) of the table, three measures of post-offer operating performance are added as independent variables. We add these concurrent variables to see if they can explain the difference in abnormal returns between the global and domestic samples. As expected, there is a close relationship between abnormal returns and concurrent operating performance, as reflected in the positive and significant coefficients of these newly added variables. More importantly, the coefficient of the global dummy variable remains negative and significant at the 5% level in all three regressions. Specifically, the coefficient of the global dummy is −0.401, −0.1356, and −0.4728, respectively, when BHAR, CAR, and the intercept from the Fama and French regression are used as abnormal returns. In other words, the post-offer operating performance cannot explain away the cross-sectional difference in long-run returns between global and domestic IPOs. The relationship between abnormal returns and concurrent operating performance will be explored further in the next section.

4. Potential explanations of the long-run return shortfall of global IPOs

Having established the empirical result that global IPO firms underperform their purely domestic counterparts in the long run, this section explores potential sources of the performance shortfall for global issuers.

4.1. Association of operating performance with long-run returns

We begin our investigation with the post-offer operating performance to see if the long-run return shortfall for global IPO firms is caused by subsequent poor operating performance.

Table 5 reports the median results of the three operating performance measures from one year prior to the offer to three years after the offer. At the time of the offer (year 0), there is not much difference in terms of net profit margin or return on asset, though global issuers have higher EBITDA/Asset. The operating performance peaks in year 0 or year 1 for both types of IPOs. This result is consistent with Jain and Kini (1994), who find that the operating performance of IPO firms worsens after they go public. For global IPOs, the median EBITDA/Asset, net profit margin, and return on asset decline, respectively, by 17.83%, 33.01%, and 21.23% from year 0 to year 3. In comparison, the domestic IPO firms have much worse operating performance during the same period, with the median declining by 29.41%, 68.96%, and 67.83%, respectively for the three performance measures. Based on the non-parametric tests, global issuers have relatively better operating performance compared to their domestic counterparts in the three years after offer.

The result that global issuers have relatively better operating performance but have lower returns in the post-IPO period suggests that investors may expect much better operating performance from these global issuers. When unduly high expectations are not materialized, stock prices regress to their true values.

To gain more perspectives, we split each IPO sample into two subsamples based on whether or not operating performance improves from year 0 to year 3. The results are reported in Panel D of Table 5. In general, IPO firms whose operating performance

Table 5
Post-offer operating performance

Fiscal year relative to the year of offering (year 0)						
	−1	0	+1	+2	+3	Δ from 0 to +3
Panel A: EBITDA/Asset						
Global IPOs	0.1475	0.157	0.1475	0.134	0.129	−17.83%
Domestic IPOs	0.155	0.136	0.122	0.1075	0.096	−29.41%
Z-statistic	0.11	4.11***	5.73***	5.58***	5.93***	3.02***
Panel B: Net profit margin						
Global IPOs	2.472	4.614	4.888	3.901	3.091	−33.01%
Domestic IPOs	3.418	4.729	3.708	2.292	1.468	−68.96%
Z-statistic	−0.80	0.16	3.71***	4.15***	4.72***	4.43***
Panel C: Return on asset						
Global IPOs	2.409	4.16	4.794	3.638	3.277	−21.23%
Domestic IPOs	4.671	5.453	4.431	2.842	1.754	−67.83%
Z-statistic	−2.10**	−0.56	2.72***	2.80***	3.96***	4.23***

Panel D: Three-year BHAR and CAR partitioned by operating performance

Long-run abnormal return	Global IPOs			Domestic IPOs		
	Whole Sample	ROA improved	ROA worsened	Whole Sample	ROA improved	ROA worsened
BHAR	−15.41%	46.23%	−55.08%	−14.89%	63.56%	−42.38%
CAR	−10.63%	29.34%	−34.62%	−11.48%	36.31%	−26.98%

This table reports the median of three operating performance measures of the sample IPO firms. EBITDA represents earnings before interest, taxes, deprecation, and amortization. Net profit margin is the ratio of net income before extraordinary items to net sales. Return on asset (ROA) is the ratio of net income before extraordinary items to total assets. The *Z*-statistics test the equality of medians between the global sample and its domestic control sample using the non-parametric tests. All accounting data are measured at the end of the fiscal year. Performance measures are expressed in percentage. Panel D reports the three-year BHARs and CARs partitioned by whether or not ROA improved or worsened in the same post-IPO period.

** Significant at 5% level.

*** Significant at 1% level.

improves have positive abnormal returns while firms with declining operating performance have negative abnormal returns as measured by BHARs and CARs. This result is consistent with the regression results reported in Table 4.

Since the results using BHARs or CARs are similar, the following discussions focus on BHARs. The average three-year BHAR for those global issuers whose operating performance does not improve is −55.08%, compared to −42.38% for similar issuers in the domestic sample. For those global IPO firms that demonstrate improvement in operating performance, the average three-year BHAR is 46.23%. In comparison, similar domestic issuers have an average three-year BHAR of 63.56% in the domestic sample. These results suggest that global issuers with poor subsequent operating performance are punished more than are similar domestic issuers, and that global issuers whose operating performance improves do not provide as much return performance as do similar domestic issuers. Consistent with the investor overoptimism story associated with global issues, the results are a reflection of investors' high expectations prior to offer and subsequent disappointments after offer of global IPOs.

4.2. Association of global tranche with long-run returns

Our empirical evidence so far strongly supports the window of opportunity hypothesis regarding the motivation of global offerings. That is, IPO firms are able to time the market to take advantage of periodic swings of investor optimism. An implication of this hypothesis is that global issuers would allocate more shares to foreign investors when their demand for their shares is high, predicting a negative correlation between long-run returns and shares allocated into the global tranche. Before we investigate this implication, a caveat about the measurement of the global tranche is in order. As pointed out by Wu and Kwok (2003), there needs to be some clarification between "filed" amount versus actual "allocation". Regulators require an indication of the percentage of shares to be sold into any jurisdiction, and 20% is sometimes a rough approximation that gives the underwriters a reasonable amount of flexibility and satisfies regulators. The actual allocation could be more or less than the filed amount. With a potential measurement problem for the global tranche, the results should be interpreted with caution.

The summary statistics of the global tranche, defined as the percentage of shares reserved exclusively for overseas investors in a global offer, is reported in Panel A of Table 6. In our sample of 496 global offers, the size of the global tranche ranges from 4.44% to 55% with a mean of 20.5% and a median of 20%.

To examine the association of long-run returns with global tranche, we divide the global offers into three groups based on the size of the global tranche. Using 20% as a cut-off point, 306 global offers set the global tranche at precisely 20%, 104 offers below 20%, and 86 offers above 20%. The BHARs and CARs up to three years after offer for each of the three subgroups are presented in Panel B of Table 6. The results indicate that global offers with a larger global tranche (>20%) underperform those with a lower global tranche (<20%). In the first three years after offer, for instance, global issuers with a larger global tranche underperform the market by 26.2% while those with a lower global tranche trail the market only by 6.02%. The average three-year CAR for global offers with a larger global tranche is −16.43%, compared to −6.48% for those with a lower global tranche.

Panel C of the table reports the regression results of the calendar-time monthly portfolio returns using the market model and the Fama–French factor model for each of the three groups categorized by the global tranche. While the intercepts are negative in all regressions, they are statistically significant only for global issues with a global tranche larger than 20%. For this group of global issuers, the intercept term is −0.9932 in the market model and it is −0.9246 in the factor model. Both are significant at the 5% level. This means that the overall result that global IPOs underperform, as reported in Table 3, is driven mainly by those that allocate more shares in the global tranche.

4.3. Association of offer price revisions and long-run returns

While the IPO is being registered with the Securities and Exchange Commission (SEC), the issuing firm and its underwriters conduct road shows to present the issue to prospective investors. Meanwhile, the underwriters solicit information from informed investors through non-binding indications of interest. Information obtained during this period is used to revise the offer price. To investigate the association of price revisions and long-run returns, we partition each sample of IPOs into three categories based on offer price

Table 6
Global tranche and long-run returns

Mean	Minimum	Maximum	Median	Standard deviation
Panel A: Summary statistics of global tranche				
20.51%	4.44%	55%	20%	5.53%

	Global Tranche $< 20\%$ [$N = 104$]	Global Tranche $= 20\%$ [$N = 306$]	Global Tranche $> 20\%$ [$N = 86$]
Panel B: Mean ad median BHAR categorized by global tranche			
Two-year BHAR	−0.92% (−11.69%)	−9.98% (−25.76%)	−18.75% (−34.77%)
Two-year CAR	−3.61% (5.91%)	−7.66% (−0.58%)	−13.41% (−7.06%)
Three-year BHAR	−6.02% (−27.83%)	−15.57% (−41.32%)	−26.20% (−50.82%)
Three-year CAR	−6.48% (4.92%)	−10.40% (−5.14%)	−16.43% (−16.65%)

	Global Tranche $< 20\%$ [$N = 104$]		Global Tranche $= 20\%$ [$N = 306$]		Global Tranche $> 20\%$ [$N = 86$]	
Panel C: Market model and Fama–French three-factor model regressions						
Intercept	−0.3477	−0.1528	−0.2885	−0.1876	−0.9932	−0.9246
	[−0.87]	[−0.41]	[−0.80]	[−0.57]	[−2.39]**	[−2.29]**
$R_m - R_f$	1.3948	1.295	1.2786	1.2405	1.3232	1.3249
	[15.70]***	[13.78]***	[16.04]***	[14.83]***	[14.29]***	[12.93]***
SMB		0.537		0.6165		0.4763
		[4.64]***		[6.10]***		[3.77]***
HML		−0.077		0.1387		0.1979
		[−0.50]		[1.07]		[1.19]
Adj. R^2	0.59	0.65	0.60	0.68	0.54	0.57

Panel A of the table presents the summary statistics of the global tranche, defined as the percentage of total shares allocated exclusively to overseas investors in the global offering. Panel B reports the mean and median (in parenthesis) buy-and-hold abnormal returns (BHAR) and cumulative abnormal return (CAR) of the global sample categorized by the size of the global tranche, using 20% as a cutoff point. The number of valid observations is in brackets. Panel C reports the regression results of the calendar-time monthly portfolio returns using the market model and the Fama and French (1993) three-factor model as below:

$$R_t - R_{ft} = \alpha + \beta(R_{mt} - R_{ft}) + s\mathrm{SMB}_t + h\mathrm{HML}_t + \varepsilon$$

where R_t is the average monthly portfolio return for each sample in month t. The three Fama–French factors are the excess return on the market portfolio ($R_{mt} - R_{ft}$), the difference in the returns of value-weighted portfolios of small stocks and large stocks (SMB_t), and the difference in returns of value-weighted portfolios of high book-to-market stocks and low book-to-market stocks (HML_t). Ordinary least squares (OLS) regressions are estimated and the t-statistics are shown in brackets.

* Significant at 10% level.
** Significant at 5% level.
*** Significant at 1% level.

revisions relative to the suggested price range revealed in the preliminary prospectus. We report the two- and three-year BHARs and CARs for each category in Table 7.

Inspection of the table reveals significant differences in the long-run performance between the two types of IPOs. To set up the stage, we discuss the results for domestic IPOs first. The results, reported in Panel A of the table, indicate that though hot IPOs (with upward price revisions) have better BHARs and CARs than other IPOs, the difference between hot and cold IPOs (with downward price revisions) is not significant based on non-parametric test. This result is consistent with Loughran and Ritter (2001) and Logue et al. (2002) that report no long-run predictive ability when IPOs are categorized by revisions in the offer price.

Table 7
Market adjusted buy-and-hold returns partitioned by offer price revisions

Sample	Number	Two-year BHAR	Two-year CAR	Three-year BHAR	Three-year CAR
Panel A: Domestic IPOs					
$P_0 < P_L$	533	−6.66	−11.47	−10.70	−10.84
$P_L \leqslant P_0 \leqslant P_H$	1,185	−14.64	−12.33	−24.83	−14.90
$P_0 > P_H$	475	3.49	−6.12	5.19	−3.68
Non-parametric test		0.27	0.99	0.70	1.26
Panel B: Global IPOs					
$P_0 < P_L$	138	−7.11	−6.78	−8.41	−5.36
$P_L \leqslant P_0 \leqslant P_H$	228	−5.63	−4.58	−7.83	−7.39
$P_0 > P_H$	130	−19.20	−14.55	−36.14	−21.89
Z-Statistic		−1.69*	−0.88	−2.20**	−1.56

This table reports the mean market adjusted buy-and-hold returns for the global and the domestic samples, each of which is partitioned into three subsamples based on the offer price (P_0) relative to the file range that has a lower bound (P_L) and an upper bound (P_H). Returns are expressed in percentage. *Z*-statistic is based on the non-parametric test of the difference in medians between hot IPOs ($P_0 > P_H$) and cold IPOs ($P_0 < P_L$).

* Significant at 10% level.

** Significant at 5% level.

The results for global IPOs are reported in Panel B of Table 7. Unlike their domestic counterparts, hot global IPOs underperform other issues in each of the holding periods. The average two- and three-year BHARs are −19.20% and −36.14% for hot global issues, compared to −7.11% and −8.41% for cold global issues during the same periods. The difference in BHARs is statistically significant between the two types of global IPOs based on the non-parametric test.

The results using CARs are similar. Hot global issues, on average, underperform the market by 21.89% in the three years after offer. In contrast, global issues whose offer price is below the file range trail the market by only 5.36% and global issues priced within the file range underperform the market by 7.39% during the same period. Nevertheless, the difference in CARs between hot and cold global IPOs is not strong statistically.

5. Summary and conclusions

This paper provides an empirical investigation of the long-run impact on US companies that opt for global IPOs. To gauge long-run returns, we compute both the buy-and-hold abnormal returns and the cumulative abnormal returns up to three years after issuance. We use the Fama–French factor model to overcome cross-correlations of event-firm abnormal returns. We also use the regression approach to account for firm and offer characteristics that may attribute to cross-sectional performance differences of IPO firms.

Overall, we find that global IPO firms significantly underperform the market and their purely domestic counterparts. Within the global sample, issues with a larger global tranche are more prone to long-run return shortfall than others. In fact, the overall result that global IPOs underperform is primarily driven by those with a larger global tranche. Global issuers fare relatively better in terms of operating performance during the post-IPO period, though both global and domestic issuers on average experience worsening operating performance. The fact that global issuers have better operating performance but lower long-run returns is consistent with unduly high expectations of the future prospects for

global issuers. When IPOs are categorized by revisions in the offer price, domestic and global IPOs have distinctive patterns in long-run abnormal returns. Unlike domestic issues, price revisions have some predictive power of long-run returns for global IPOs: hot global IPOs are the worst return performers in the long run. Piece by piece, the evidence builds up to strongly support the window of opportunity hypothesis associated with global equity offerings. This hypothesis postulates that investors are overly optimistic about the future prospects of firms engaging in global offerings and bid up the prices of these issues above the long-run value. Consequently, underperformance occurs as these unduly high expectations are corrected over time.

As is true with any financial anomaly, an important issue is why arbitrage cannot potentially eliminate the persistent higher overvaluations associated with global IPOs. In fact, a simple trading rule where one goes long with all domestic IPOs and simultaneously sells short all global IPOs will yield positive abnormal returns in the long run. Previous studies suggest that even if there is systematic long-run performance difference between the two types of issuing mechanisms, it is difficult or impossible to explore it in a reliable manner. For instance, the limits of arbitrage literature suggests that rational arbitrageurs may be unable to credibly convey their strategies to rational investors, and therefore may be unable to keep funds committed to arbitrage (e.g., Shleifer and Vishny, 1997). The intuition is that arbitrageurs typically work with other people's money and those people tend to have short investment horizon and withdraw funds after poor performance.

Brav and Heaton (2002) compare and analyze two competing theories of financial anomalies: behavior theories built on investor irrationality and rational uncertainty structure theories built on incomplete information about the structure of the economic environment. They demonstrate that the two theories are hard to distinguish. If rational structural uncertainty causes financial anomalies, then their disappearance hinges on the ability of the rational investors to become better calibrated to the structural features of the data. Even if irrationality generates financial anomalies, their disappearance still may hinge on rational learning.

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