Accepted Manuscript

Does inflation affect sensitivity of investment to stock prices? Evidence from emerging markets

Omar Farooq , Neveen Ahmed

PII: S1544-6123(16)30308-7
DOI: 10.1016/j.frl.2017.10.019
Reference: FRL 802

To appear in: *Finance Research Letters*

Received date: 14 November 2016
Revised date: 5 June 2017
Accepted date: 23 October 2017

Please cite this article as: Omar Farooq , Neveen Ahmed , Does inflation affect sensitivity of investment to stock prices? Evidence from emerging markets, *Finance Research Letters* (2017), doi: 10.1016/j.frl.2017.10.019

Highlights

- Examination of the relationship between inflation and sensitivity of investment to stock prices.
- Data used from 37 emerging markets.
- Investment of firms headquartered in countries with higher inflation is significantly less sensitive to their stock prices than that of firms headquartered in countries with lower inflation.
- Main reason behind the result is that stock prices are less informative in countries with high inflation.

Does inflation affect sensitivity of investment to stock prices? Evidence from emerging markets

Omar Farooq (Corresponding auhor)
La Rochelle Business School
La Rochelle 17000, France

Neveen Ahmed
American University in Cairo
Cairo 11835, EGYPT

Abstract
This paper uses data from 37 emerging markets and shows that investment of firms headquartered in countries with higher inflation is significantly less sensitive to their stock prices than that of firms headquartered in countries with lower inflation. We argue that stock prices are less informative in countries with high inflation. As a result, managers are less likely to use stock prices in their investment decisions, thereby lowering sensitivity of investment to stock prices in countries with higher inflation.

JEL Classification: G31
Keywords: Inflation; Stock Prices; Capital Expenditures; Emerging Markets.

---

1. Introduction

This paper is an attempt to identify the welfare cost of inflation by documenting its impact on the relationship between capital expenditures (investment) undertaken by firms and stock prices. Our arguments take their motivation from prior literature that documents negative effect of inflation on the information content of prices. Friedman (1977), for instance, argues that inflation reduces the information content in prices by increasing the noise. In another related study, Modigliani and Cohn (1979) state that investors suffer from "inflation illusion" and do not incorporate the effect of inflation in their forecasts, thereby causing equity mispricing. Fischer (1981) also maintains that inflation is associated with price variability that is unrelated to fundamentals. We argue that deviations from fundamentals should reduce the information content of stock prices. Above arguments are consistent with Ball and Romer (2003) who develop a model in which inflation reduces informativeness of prices. In their model, decision of consumers to enter into a long-term relationship with sellers depends on a firm's current price. They argue that firm's current price is a signal about prices that a firm will charge in future. They show that when inflation causes relative prices to vary, it reduces the information about future prices in current prices. Consequently, current prices become less informative. Tommasi (1996) also reports that inflation degrades the informational content of prices by making aggregate demand shocks unpredictable.[1] He maintains that it is optimal for firms to adjust output less in response to all shocks, including idiosyncratic real demand shocks. The outcome of this misperception is that prices fluctuate more to equate quantity demanded with the less variable quantity supplied. Given that inflation leads to higher variability in prices, it becomes hard for economic agents to detect relevant information from prices (Hsu et al., 2013).[2] Our arguments are also consistent with a strand of literature that argues that stock market agents (that is, analysts and investors) are not able to make accurate forecasts in the presence of high inflation, thereby making stock prices less informative. Basu et al. (2010) show that analysts do not fully incorporate expected inflation information in their forecasts. In another related study, Chordia and Shivakumar (2005) show that, during periods of high inflation, investors do not accurately predict earnings.

An important implication of lower information value of stocks prices that accompany high inflation regimes is concerned with sensitivity of investment to stock

[1] The intuition underlying above arguments is described in detail in Lucas (1973), Barro (1976) and Hercowitz (1981).

[2] Engle and Rangel (2008) show that countries with high rates of inflation tend to have high stock market volatility. In another related study, Saryal (2007) document that higher the rate of inflation, the greater is stock market volatility.

prices. Prior literature argues that sensitivity of investment to stock prices is an increasing function of informativeness of prices (Foucault and Frésard, 2012; Farooq and Amin, 2017). This strand of literature maintains that managers use information revealed via stock prices to find out what stock market participants think about the future prospects of their firms (Dow and Gorton, 1997; Subrahmanyam and Titman, 1999). Foucault and Frésard (2012), for example, show that sensitivity of corporate investment to stock price increases as the amount of information in stock prices increase. They argue that investment sensitivity to stock prices increase because value maximizing managers are forced to use information transmitted via stock prices to forecast cash flows of their capital allocation decisions. Their forecasts depend not only on their own information but also on information conveyed via stock prices (because stock prices reflect information that is not known to them). They argue that value maximizing managers are inclined to use this information to improve their investment decisions. It, therefore, leads to higher sensitivity of investment to stock prices. In another recent study, Farooq and Amin (2017) also document the same by showing that sensitivity of investment to stock prices increases as informativeness of stock prices increase. They argue that if informativness of stock prices go down, managers rely less on stock prices to make investment decisions, thereby reducing sensitivity of investment to stock prices.

Consistent with above arguments, this paper shows that sensitivity of investment to stock prices depends on inflation prevailing in the country. Using data from 37 emerging markets, we show that higher inflation leads to reduction in sensitivity of investment to stock prices during the period between 2009 and 2014. We argue that higher inflation reduces efficiency of prices, thereby resulting in lower reliance of managers on stock prices. As a result, sensitivity of investment to stock prices goes down in regimes with high inflation. Our results are robust across various estimation procedures and across various sub-samples. We also show that negative impact of inflation on sensitivity of investment to stock prices is less pronounced in countries with stronger governance and information environment.

The remainder of the paper is structured as follows: Section 2 summarizes the data. Section 3 presents assessment of our hypothesis. Section 4 presents additional tests, while the paper ends with Section 5 where we present conclusions.

2. Data

This paper documents the effect of inflation on sensitivity of investment to stock prices in emerging markets during the period between 2009 and 2014. For the purpose of this study, our sample consists of non-financial firms listed in Argentina, Bangladesh, Brazil, Bulgaria, Chile, China, Colombia, Czech Republic, Egypt, Ghana, Greece, Hungary, India, Indonesia, Israel, Jordan, Kuwait, Malaysia, Mexico, Morocco, Nigeria, Pakistan, Peru, Philippines, Poland, Romania, Russia, Saudi Arabia, South Africa, South Korea, Sri Lanka, Taiwan, Thailand, Turkey, UAE, Venezuela, and Vietnam. The following sub-sections will explain data in greater details. All data is in dollars.

2.1 Main variables

- CAPEX: It is a measure of corporate investment in year t. It is measured by the ratio of capital expenditures in that year scaled by lagged book assets (Foucault and Frésard, 2012).
- Q: This paper uses Tobin's Q as a measure of normalized prices. We compute Q as the market value of equity plus book value of assets minus the book value of equity, scaled by book assets (Foucault and Frésard, 2012).
- INFLATION: It is defined as a sustained increase in the general level of prices for goods and services. It is measured as an annual percentage increase.

Table 1 documents descriptive statistics for the main variables used in analysis. The results shows relatively similar amount of capital expenditures across our sample countries. However, in case of Tobin's Q, our sample shows considerable variation across countries.

[Insert Table 1 here]

2.2 Control variables

In addition to above variables, we use log of total assets (SIZE), total debt to total asset ratio (LEVERAGE), earnings per share (EPS), growth sales (GROWTH), and dividend payout ratio (PoR) as control variables. All of these variables are expected to affect capital expenditures.

3. Methodology

In order to document, the impact of inflation on sensitivity of investment to stock prices, we estimate various versions of the following equation. All variables are as defined above. For the purpose of completeness, we also include industry dummies (IDUM) and year dummies (YDUM) in our analysis. Our estimation is similar in spirit to earlier studies, such as Foucault and Frésard (2012) and Farooq and Amin (2017).

$$\begin{aligned} \mathrm{CAPEX}_t = {} & \alpha + \beta_1(\mathrm{Q}_{t-1}) + \beta_2(\mathrm{INFLATION}_{t-1}) + \beta_3(\mathrm{Q}_{t-1} * \mathrm{INFLATION}_{t-1}) \\ & + \beta_4(\mathrm{SIZE}_{t-1}) + \beta_5(\mathrm{LEVERAGE}_{t-1}) + \beta_6(\mathrm{GROWTH}_{t-1}) + \beta_7(\mathrm{EPS}_{t-1}) \\ & + \beta_8(\mathrm{PoR}_{t-1}) + \sum_{I=1}^{N-1} \gamma_I\,(\mathrm{IDUM}_{t-1}) + \sum_{Y=1}^{N-1} \theta_Y\,(\mathrm{YDUM}_{t-1}) + \varepsilon_t \end{aligned} \tag{1}$$

The results of our analysis are reported in Table 2.[3] The parameter of interest in this analysis is the coefficient of Q*INFLATION. Our results show that sensitivity of investment to stock prices is lower in regimes characterized by high inflation. We report significantly negative coefficient of Q*INFLATION. We argue that high inflation reduces informativeness of stock prices (Ball and Romer, 2003). Lower informativeness of prices results in lower sensitivity of investment to stock prices.

[Insert Table 2 here]

There may be concerns that our results are confined to certain stocks. In order to overcome this concern, we divide our sample into two groups based on size. We re-

[3] As an additional test, we compute the standard errors by clustering the observations within each firm. Peterson (2009) considers such clustering as a mechanism to account for serial correlation and heteroskedasticity. Our unreported results show that significance of variables remains qualitatively the same.

estimate Equation (1) for both groups. Table 3 documents the results of our analysis. Our results remain qualitatively the same for both sub-samples. We report significantly negative coefficient of Q*INFLATION for sub-samples of small and large firms.

[Insert Table 3 here]

4. Additional tests

4.1 Inflation and sensitivity of investment to stock prices (quantile regression analysis)

Our analysis implies that no matter what point on the conditional distribution is analyzed, the impact of inflation on the sensitivity of investment to stock prices remains the same. To test the empirical validity of this restrictive assumption and to document the relationship at different points of conditional distribution of capital expenditures, a quantile regression is applied at five quantiles (namely 0.10, 0.30, 0.50, 0.70, and 0.90). The results of our analysis are reported in Table 4. Consistent to above findings, we report significantly negative coefficient of Q*INFLATION for all points of conditional distribution of capital expenditures.

[Insert Table 3 here]

4.2 Country-specific information environment and the relationship between inflation and sensitivity of investment to stock prices

In order to document the effect of country-specific information environment on the relationship between inflation and sensitivity of investment to stock prices, we estimate various versions of the following regression equation. In the following regression, GOV is a variable that proxies for governance environment of a country. For the purpose of this paper, we use the following proxies of governance environment of a country: (1) Legal tradition, (2) Rule of law, (3) Property rights, and (4) Regulatory quality.[4]

$$\begin{aligned}\mathrm{CAPEX_t} = {} & \alpha + \beta_1(\mathrm{Q_{t-1}}) + \beta_2(\mathrm{INFLATION_{t-1}}) + \beta_3(\mathrm{Q_{t-1}} * \mathrm{INFLATION_{t-1}}) \\ & + \beta_4(\mathrm{GOV_{t-1}}) + \beta_5(\mathrm{Q_{t-1}} * \mathrm{INFLATION_{t-1}} * \mathrm{GOV_{t-1}}) + \beta_6(\mathrm{SIZE_{t-1}}) \\ & + \beta_7(\mathrm{LEVERAGE_{t-1}}) + \beta_8(\mathrm{GROWTH_{t-1}}) + \beta_9(\mathrm{EPS_{t-1}}) + \beta_{10}(\mathrm{PoR_{t-1}}) \\ & + \sum_{\mathrm{I}=1}^{\mathrm{N}-1} \gamma_{\mathrm{I}}\,(\mathrm{IDUM_{t-1}}) + \sum_{\mathrm{Y}=1}^{\mathrm{N}-1} \theta_{\mathrm{Y}}\,(\mathrm{YDUM_{t-1}}) + \varepsilon_t\end{aligned} \quad (2)$$

The results of our analysis are reported in Table 4. The parameter of interest in above regression equation is the coefficient of Q*INFLATION*GOV. We report significantly positive coefficient of Q*INFLATION*GOV for all proxies of governance environment of a country. Our result indicate that negative effect of inflation on sensitivity of investment to stock prices is less pronounced in countries with stronger governance environment. We argue that negative impact of inflation on informativeness of prices is less pronounced in countries with stronger governance environment. Therefore, managers in these countries are more likely to use information from stock prices relative to otherwise similar countries with weaker governance environment.

[Insert Table 4 here]

5. Conclusions

In this paper, we test the hypothesis that high inflation emasculates the ability of managers to use information from the stock market to make value enhancing investment decisions. Using the data from 37 emerging markets, we show that investments of firms

---

[4] Legal tradition is a dummy variable that takes the value of 1 if the country follows common law traditions and 0 otherwise. Rule of law indicates the quality of contract enforcement, effectiveness of police and courts, likelihood of crime and violence, and abidance of rules of society by the citizens. The variable is obtained from the World Bank Governance Indicators and is measured in a way that higher value indicates stronger rule of law. Regulatory quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The variable is obtained from the World Bank Governance Indicators and is measured in a way that higher value indicates better regulatory quality. A property right is defined as the exclusive authority to determine how a resource is used. The data regarding property rights is obtained from the Heritage Foundation.

headquartered in high inflation regimes are significantly less sensitive to stock prices than that of firms headquartered in low inflation regimes. We argue that our results are driven by the effect of inflation on the informativeness of stock prices. Inflation reduces the informativeness of stock prices, thereby leading to lower sensitivity of investment to stock prices.

References

Ball, L. and Romer, D., (2003). Inflation and the Informativeness of Prices. Journal of Money, Credit, and Banking, 35(2), pp. 177-196.

Barro, R.J., (1976). Rational Expectations and the Role of Monetary Policy. Journal of Monetary Economics, 2(1), pp. 1-32.

Basu, S., Markov, S., and Shivakumar, L., (2010). Inflation, Earnings Forecasts, and Post-earnings Announcement Drift. Review of Accounting Studies, 15(2), pp. 403-440.

Chordia, T. and Shivakumar, L., (2005). Inflation Illusion and Post-earnings-announcement Drift. Journal of Accounting Research, 43(4), pp. 521-556.

Dow, J. and Gorton, G., (1997). Stock Market Efficiency and Economic Efficiency: Is There a Connection? Journal of Finance, 52(3), pp. 1087–1129.

Engle, R.F. and Rangel, J.G., (2008). The Spline GARCH Model for Unconditional Volatility and its Global Macroeconomic Causes. Review of Financial Studies, 21(3), pp. 1187-1222.

Farooq, O. and Amin, A., (2017). National Culture, Information Environment, and Sensitivity of Investment to Stock Prices: Evidence from Emerging Markets. Research in International Business and Finance, 39(A), pp. 41-46.

Fisher, S., (1981). Relative Shocks, Relative Price Variability, and Inflation. Brookings Papers on Economic Activity, 2, pp. 381-431.

Foucault, T. and Frésard, L., (2012). Cross-Listing, Investment Sensitivity to Stock Prices, and Learning Hypothesis. Review of Financial Studies, 25(1), pp. 3305-3350.

Friedman, M., (1977). Nobel Lecture: Inflation and Unemployment. Journal of Political Economy, 85(3), pp. 451-472.

Hercowitz, Z., (1981). Money and the Dispersion of Relative Prices. Journal of Political Economy, 89(2), pp. 328-356.

Hsu, J.C., Kudoh, H., and Yamada, T., (2013). When Sell-Side Analysts Meet High-Volatility Stocks: An Alternative Explanation for the Low-Volatility Puzzle. Journal of Investment Management, 11(2), pp. 28-46.

Lucas, R.E., (1973). Some International Evidence on Output-Inflation Tradeoffs. American Economic Review, 63(3), pp. 326-334.

Modigliani, F. and Cohn, R.A., (1979). Inflation, Rational Valuation and the Market. Financial Analysts Journal 35, pp. 24–44.

Petersen, M.A., (2009). Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches. Review of Financial Studies 22(1), pp. 435-480.

Saryal, F.S., (2007). Does Inflation Have an Impact on Conditional Stock Market Volatility? Evidence from Turkey and Canada. International Ressearch Journal of Finance and Economics, 11, pp. 123-133.

Subrahmanyam, A. and Titman, S., (1999). The Going-Public Decision and the Development of Financial Markets. Journal of Finance, 54(3), pp. 1045-1082.

Tommasi, M., (1996). Inflation and Informativeness of Prices: Microeconomic Evidence from High Inflation. Brazilian Review of Econometrics, 16(2), pp. 37-75.

Table 1: Descriptive statistics

	Variables	No. of Observations	INVEST	Q
Latin America	Argentina	294	0.0607	1.1773
	Brazil	572	0.0636	1.5509
	Chile	647	0.0575	1.3222
	Colombia	116	0.0612	1.2864
	Mexico	448	0.0527	1.5289
	Peru	328	0.0637	1.3765
	Venezuela	40	0.0518	0.7212
Europe	Bulgaria	494	0.0319	1.0336
	Czech Republic	41	0.0556	1.1376
	Greece	907	0.0301	0.9598
	Hungary	114	0.0661	1.1294
	Poland	1448	0.0505	1.2139
	Romania	110	0.0441	0.8817
	Russia	1158	0.0665	1.0751
	Turkey	1071	0.0494	1.2874
Africa	Egypt	418	0.0458	1.3593
	Morocco	170	0.0523	1.6852
	Ghana	67	0.0809	1.7847
	Nigeria	158	0.0990	1.7389
	South Africa	1159	0.0631	1.4183
Asia	Bangladesh	105	0.0663	2.2208
	China	7456	0.0750	2.0826
	India	10338	0.0697	1.2003
	Indonesia	1272	0.0656	1.4399
	Israel	1181	0.0315	1.2551
	Jordan	485	0.0323	1.3040
	Kuwait	395	0.0420	1.2285
	Malaysia	4010	0.0424	1.0353
	Pakistan	646	0.0548	1.1850
	Philippines	583	0.0551	1.4541
	Saudi Arabia	489	0.0657	1.7352
	South Korea	7086	0.0585	1.1016
	Sri Lanka	731	0.0567	1.3719
	Taiwan	3583	0.0469	1.2707
	Thailand	2011	0.0581	1.3117
	United Arab Emirates	206	0.0575	1.0477
	Vietnam	2401	0.0584	1.0176

Table 2: Effect of inflation on investment-price sensitivity

Variables	Model (1)	Model (2)	Model (3)
Q	0.0149***	0.0114***	0.0100***
INFLATION	0.0029***	0.0035***	0.0032***
Q*INFLATION	-0.0009***	-0.0009***	-0.0008***
SIZE		0.0047***	0.0045***
LEVERAGE			-0.0003***
EPS			-0.0003
PoR			0.0001
GROWTH			0.0002***
Fixed Effects	Yes	Yes	Yes
No. of Observations	43422	43422	37313
F-Value	76.36***	131.78***	100.82***
Adjusted R-Square	0.035	0.047	0.047

Table 3: Effect of inflation on investment-price sensitivity in different sub-samples

Variables	Small Firms	Large Firms
Q	0.0106***	0.0104***
INFLATION	0.0034***	0.0032***
Q*INFLATION	-0.0009***	-0.0008***
SIZE	0.0062***	0.0029***
LEVERAGE	-0.0002***	-0.0003***
EPS	0.0037***	-0.0013***
PoR	0.0001***	-0.0001***
GROWTH	0.0001***	0.0003***
Fixed Effects	Yes	Yes
No. of Observations	18144	19169
F-Value	40.94***	32.80***
Adjusted R-Square	0.034	0.040

Table 4: Effect of inflation on investment-price sensitivity (quintile regression)

Variables	0.10	0.30	0.50	0.70	0.90
Q	-0.0001	0.0025***	0.0057***	0.0129***	0.0344***
INFLATION	0.0001***	0.0007***	0.0018***	0.0040***	0.0098***
Q*INFLATION	-0.0001	-0.0002***	-0.0006***	-0.0012***	-0.0028***
SIZE	0.0016***	0.0040***	0.0056***	0.0065***	0.0041***
LEVERAGE	-0.0001***	-0.0001***	-0.0001***	-0.0002***	-0.0003***
EPS	0.0001	0.0003	0.0001	0.0001	-0.0011*
PoR	0.0001***	0.0001***	0.0001***	0.0001***	-0.0001
GROWTH	-0.0007**	0.0001***	0.0002***	0.0004***	0.0011***
Fixed Effects	Yes	Yes	Yes	Yes	Yes
No. of Observations	37313	37313	37313	37313	37313
Adjusted R-Square	0.0253	0.0480	0.0523	0.0504	0.0462

Table 5: Country-level governance environment and the effect of inflation on investment-price sensitivity

Variables	Legal Tradition	Rule of Law	Property Rights	Regulatory Quality
Q	0.0109***	0.0093***	0.0095***	0.0081***
INFLATION	0.0034***	0.0030***	0.0033***	0.0024***
Q*INFLATION	-0.0013***	-0.0007***	-0.0016***	-0.0005***
GOV	-0.0023*	-0.0077***	-0.0003***	-0.0099***
Q*INFLATION*GOV	0.0004***	0.0004***	0.0001***	0.0005***
SIZE	0.0046***	0.0043***	0.0043***	0.0044***
LEVERAGE	-0.0003***	-0.0002***	-0.0002***	-0.0002***
EPS	-0.0002	0.0001	0.0001	0.0002
PoR	0.0001	0.0001	0.0001	0.0001
GROWTH	0.0002***	0.0002***	0.0002***	0.0002***
Fixed Effects	Yes	Yes	Yes	Yes
No. of Observations	37313	37313	37313	37313
F-Value	92.97***	98.93***	101.08***	102.06***
Adjusted R-Square	0.047	0.048	0.049	0.049