Journal of Economic Behavior and Organization 154 (2018) 33–59

Contents lists available at ScienceDirect

Journal of Economic Behavior and Organization

journal homepage: www.elsevier.com/locate/jebo

How price path characteristics shape investment behavior

Sven Nolte[a,b,*], Judith C. Schneider[a]

[a] University of Münster, Universitätsstr. 14-16, Münster D-48143, Germany
[b] California Institute of Technology, 1200 E California Blvd, Pasadena, CA 91106, USA

ARTICLE INFO

Article history:
Received 10 November 2017
Revised 20 July 2018
Accepted 29 July 2018

Keywords:
Experiment
Price paths
Behavioral investment choice
Reference point
Attribute framing
Loss aversion

ABSTRACT

Price paths are often the only graphical representation of financial products investors receive before making an investment decision. We argue that price paths serve as "graphical" *frames* that influence the perceived attractiveness of an asset by highlighting specific asset characteristics. In a controlled lab experiment we find that price paths have an impact on investment decisions. In a regression we test a simple model relating the perception of price path shapes to several heuristics. These heuristics are: focusing on more recent outcomes, deriving implicit reference prices from focal prices, focusing on losses, and estimating risk from the amplitude of the path. We conclude that investment decisions are systematically biased due to the shape of an asset's price path.

1. Introduction

A centerpiece of any investment choice is to form expectations about the future performance of investment opportunities. These expectations are based on available information at the time of judgment. One piece of information provided by many banks or insurers is a chart visualizing the price path of the asset underlying their respective product. Investment brochures usually contain many other pieces of information like risk-return profiles, but price paths stand out as they are often the only *graphical* illustration investors receive. There are numerous reasons and ways investors might take price paths into account when making investment decisions.

Recently, Barberis et al. (2016) suggest that a significant fraction of investors mentally represent the stock by the distribution of its past returns derived from omnipresent price charts and then evaluate this distribution in the way prescribed by cumulative prospect theory (CPT).

Given the large literature on framing effects, we argue that price paths mirror "graphical" *frames*, influencing the perceived attractiveness of an asset by highlighting specific asset characteristics. We focus on two aspects: A price path's label and shape. Displayed paths in investment brochures can either show the historical price development or some future price path to illustrate product characteristics, e.g., capital guarantees. We argue that simply *labeling* a price path as historical or simulated affects the consumer's decision context and thereby impacts the investment decision. Also, we highlight directly specific asset characteristics like trend or variability (spread) by varying the *shape* (the temporal sequence of returns) of the price path. We conjecture that the perception of a price path's shape activates several heuristics which impact investment choices (Hirshleifer, 2001).

* Corresponding author at: University of Münster, Universitätsstr. 14-16, Münster D-48143, Germany.
E-mail addresses: sven.nolte@wiwi.uni-muenster.de (S. Nolte), judith.schneider@wiwi.uni-muenster.de (J.C. Schneider).

https://doi.org/10.1016/j.jebo.2018.07.018
0167-2681/

We conduct a controlled lab experiment to analyze the impact of a price path's label and shape on investment behavior. Our findings reveal that price paths significantly influence amounts invested into risky assets. We provide full risk and return information on the underlying asset by means of a simplified final wealth distribution. This *relevant* information about the asset's future outcome solely underlies the incentivized payments the participants receive at the end of the experiment. The price paths with varying labels and shapes thus represent irrelevant information. Basing decisions on this irrelevant information implies a deviation from rational behavior, and we take it as evidence that price paths indeed act as graphical frames.

We carefully design four stylized price sequences (path shapes) which highlight different path characteristics and allow us to investigate the underlying cognitive processes. These characteristics are directly linked to several heuristics that have been identified as meaningful by previous literature, namely focusing on more recent outcomes (Bailey et al., 2011), deriving implicit reference prices from several focal prices (Baucells et al., 2011), focusing on losses (Brandstätter et al., 2006), and estimating risk from the amplitude of the price path (Raghubir and Das, 2010). We find that investment propensities differ depending on which characteristic of the price path is most salient.

From a practical point of view, our research is important as banks and insurers may deliberately select the most "attractive-looking" chart to better sell their products. We show that price paths are not only relevant when labeled as historical paths of an asset, but also when marked as potential future price paths.

Our findings are also important from a theoretical point of view. We gain new insights in understanding what influences investors in their judgment about an asset and what makes them willing to invest in an asset. To asses that, we include the price path characteristics in a decision model trying to explain investment amounts within the experiment. We design all price path shapes such that they display the same cross-section of daily returns in different order and choose them in a way that they are representative of real stock returns, i.e., do not look artificial. This mechanism ensures that even if participants invest according to the model proposed by Barberis et al. (2016) and construct CPT-values from implicit returns in the price paths, they should arrive at identical valuations and behave consistently across all our path shapes. We operationalize the dynamic reference point and trend by extending CPT-values from implicit returns and add spread and domain in a regression model. We find that perceived variation in returns and a focus on potential losses decrease investment propensity for both labels. Higher reference prices and negative trends lead to lower investments when paths are labeled as historical and have the opposite effect when they are labeled as simulated. Thus, we find further support for our conjecture that the impact of path characteristics depends on the context, and thus that price paths act as graphical frames.

Literature Overview

Our paper is related to several strands of literature ranging from the analysis of framing effects of asset price paths over preferences for sequences to the role of past performance information.

For a rational consumer the way information is presented does not impact the evaluation of the risk under consideration. However, the impact of framing on decision behavior is a common and robust pattern amongst sophisticated and naive individuals (Keren, 2011). The key feature of framing effects is a violation of the description invariance assumption, as most prominently displayed by the so-called "Asian disease problem" (Tversky and Kahneman, 1981). Most of the framing effects documented in the economic literature can be classified as valence framing, i.e., positive or negative descriptions of the same piece of information (Levin et al., 1998). We adopt a more general definition: frames in communication (Druckman, 2001) are any informationally equivalent presentation of a decision problem that potentially leads to different mental model representations of the framed message (Soman, 2004).

There are some papers which link framing effects to asset price paths. Weber et al. (2005) find that the presentation format of historical asset returns influences expected asset volatility. At the same time, investors' perception of the asset's risk and return is strongly driven by the familiarity of asset names and only slightly by the choice of presentation format. Contrary, Diacon and Hasseldine (2007) conclude that presentation format has a significant effect on participants' perceived risk and return. Glaser et al. (2007) associate beliefs in mean reversion or trend-chasing with framing effects. Asset forecasts vary depending on return or price presentation which can be attributed to the representativeness heuristic. They conclude that surveys on asset forecasts should rely on price presentation, see also Czaczkes and Ganzach (1996).

When it comes to preferences for sequences, Loewenstein and Prelec (1993) show in a very general setup that sequence patterns influence economic decisions. Grosshans and Zeisberger (2018) find that different shapes of price paths influence forecasts and satisfaction. However, the information provided to the participants across the different path shapes is not kept identical in their experimental setup. Moreover, none of these papers provide full information on risk and return characteristics to participants. Thus, they do not control for the potentially conflicting effects of an incomplete information set, i.e., learning about the properties of the asset from past information. Instead, participants are required to base their decision solely on past returns, so any observed effect may either stem from a different mental model caused by the framing of the decision situation or different beliefs regarding the risk and return characteristics of the underlying asset. These beliefs are almost impossible to control for, as they may be the result of a vast array of belief updating processes, including but not limited to Bayesian updating with an unknown prior, beliefs in mean reversion (Poterba and Summers, 1988), or a belief in trend continuation (Jegadeesh and Titman, 1993). Most importantly, results from previous experiments can be rationalized if these updating processes arrive at different beliefs for the respective decision situations. We fix this shortcoming by pro-