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Issues in Global Financial Markets



MARKET CHRONICLES

*By: Chew Yu Ren, Gregory Lee, Lisa Wong Lye Yee,
Neo Xin Wen Charlene, Tan Chek Lin, Valerie Yeo*

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EXECUTIVE SUMMARY

This time is different. While this phrase is often heard in the realm of finance, past performance could still provide useful clues as to how markets are likely to behave. Yet, inexperienced retail investors are greatly disadvantaged as they may not have paid the same amount of attention to market gyrations over the years, as compared to experienced traders. Our application seeks to address this gap by drawing on historical data to help them relive the past they did not live through. We hope that this application will equip them with the necessary information to see patterns in the past, remove biases in investing from incomplete information and recency effects, and make an informed investment decision.

The impact of macroeconomic and earnings surprises on stock prices are backed by empirical studies. Therefore, our application presents past performance of the S&P 500 index and its constituents alongside historical economic and earnings surprises, and also allows users to explore events that happened on days of huge market movement. Preliminary surveys have revealed that most respondents find these features useful, and would incorporate them into their investment decisions.

EMPIRICAL RESEARCH

Macroeconomic surprises

Increased volatility during surprise release. Financial markets appear to react to the surprise component of macroeconomic releases (Andersen et al, 2003), consistent with the Efficient Market Hypothesis which suggests new available information should be incorporated into security prices (Fama, 1970). This effect is confirmed by more recent empirical studies, where the arrival of news regarding macroeconomic surprises has a statistically and economically significant effect on US securities (Brenner et al, 2009).

Factors varying effect of macroeconomic surprises. However, the effect of macroeconomic surprises on asset prices can be influenced by multiple factors. Macroeconomic surprises appear to have asymmetric effects on different asset classes, as U.S. bond markets have shown to be more responsive towards such releases than equities (Xin Huang, 2015). Additionally, nonfarm payroll employment has been shown to elicit more price reaction than other indicators, and other factors including the business cycle have been found to affect the extent of market response. Furthermore, there is a time varying effect of macroeconomic surprises on asset prices - while short-term volatility is generated surrounding macroeconomic surprises, there is a weak correlation between such surprises and asset returns in the long term (Aliaga-Diaz, 2018).

Earnings surprises

Increased volatility during surprise release. Similar to macroeconomic surprises, the release of company earnings surprises tend to elicit market reaction as the volatility of returns increases on earnings announcement days (Landsman and Maydew, 2001). In fact, as the magnitude of surprise increases, the higher the trading volume reaction (Bamber, 1987). Thus, there is a significant correlation between earnings surprises and volatility and overnight returns (Lim, 2009).

Earnings surprises effect on stock price. Earnings surprises appear to have an impact on stock price through two mechanisms - cash flow effect and discount rate effect. The cash flow effect encapsulates implications of earnings surprises on the firm's growth potential, while the discount rate effect covers the implications of earnings surprises on the growth potential of the overall economy, which affects discount rate and thus stock prices (Patatoukas, 2009).

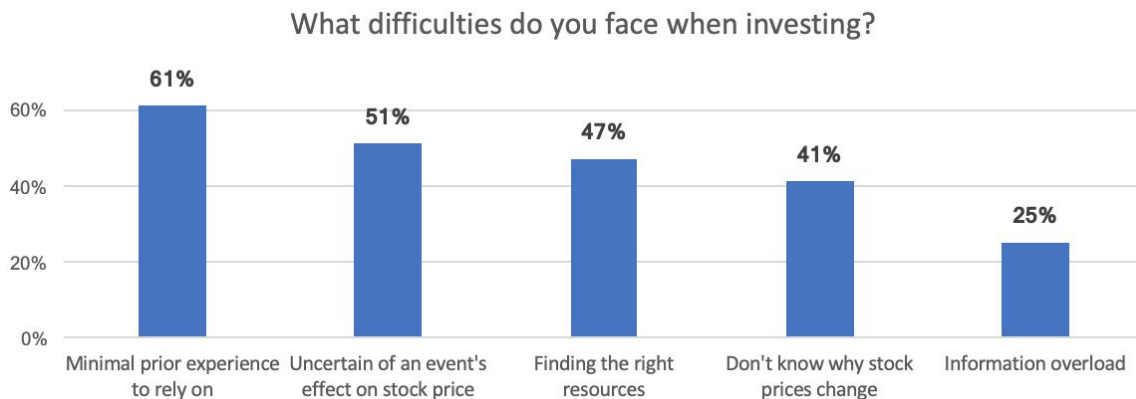
Post earnings announcement drift. Unlike macroeconomic surprises where the effect on stock price tends to be short-term, there is a well-documented phenomenon of stock prices continuing to drift in the direction of earnings surprise. In several studies, stock prices of specific companies react immediately to earnings releases, continue to drift in the same direction for three quarters, then partially reverse in quarter four (Ball and Brown, 1968; Watts, 1978; Foster, Olsen, and Shevlin, 1984; Bernard and Thomas, 1989).

MARKET ANALYSIS

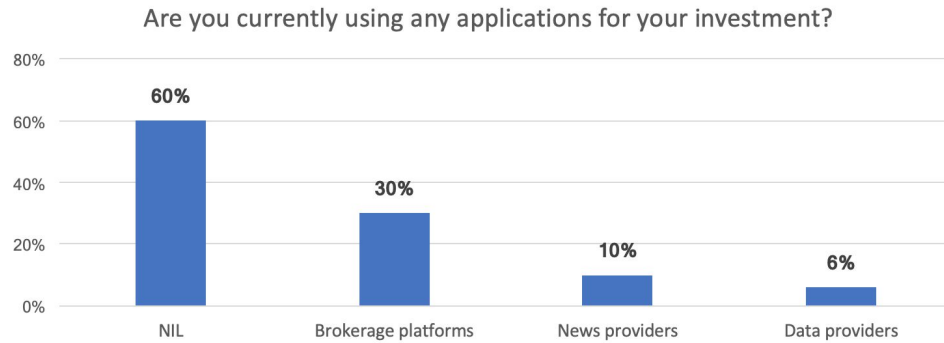
Market survey

A survey was conducted on 50 retail investors to understand the challenges they encounter in their investment process. The key findings are as follows:

- ❑ Lack of prior experience is the main difficulty faced by retail investors.



- ❑ Most retail investors do not use applications to aid their investment decisions. Out of those who do, applications used include brokerage platforms, news providers, and data providers.

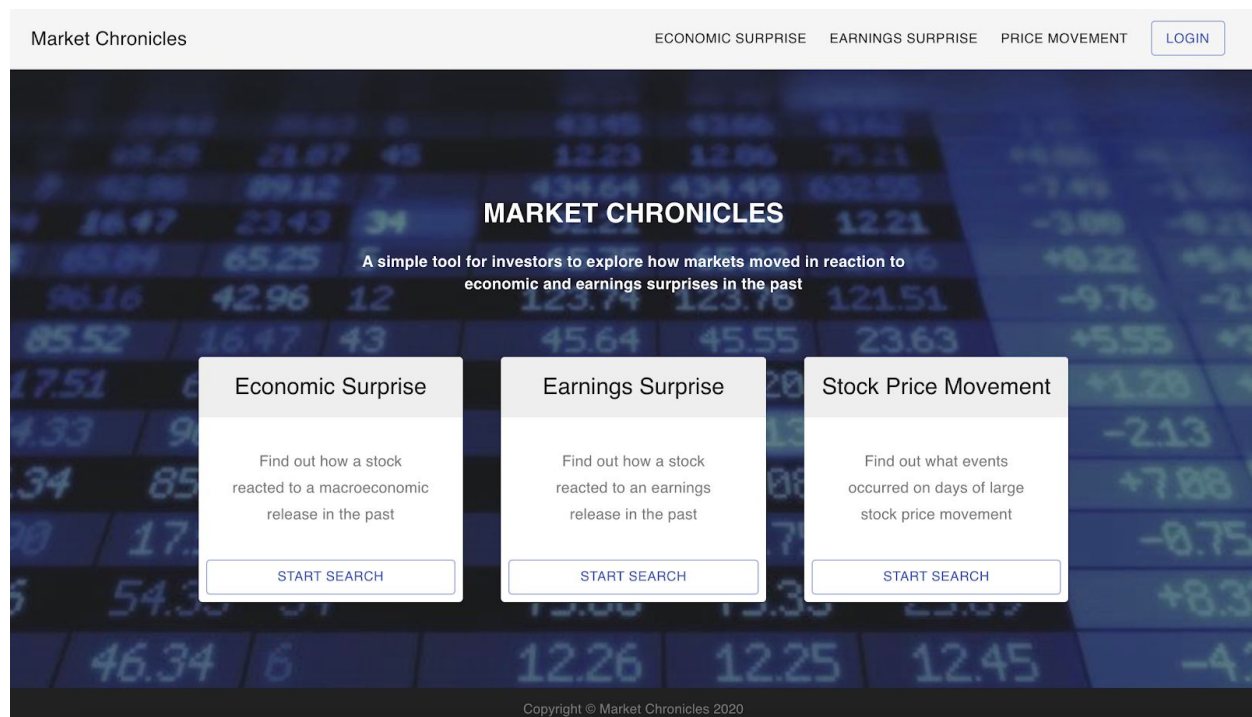


Landscape analysis

In order to understand how we can add value to the investor's experience, we shortlisted existing applications that can potentially address investors' lack of experience. These applications have been sorted into 3 buckets - brokerage platforms, news providers, and data providers.

Application type	Evaluation of application	Examples
Brokerage platforms	- Facilitates trade execution - Provides stock price history - Little information content to help investors learn	Saxo Capital Markets, TD Ameritrade, Maybank Kim Eng
News providers	- Investors informed of significant events can observe stock price reaction - Articles may draw parallels between current conditions and past - However, information is mostly in narrative form and can be scattered - hence not ideal for observing relationships	Financial Times, WSJ
Data providers	- Investors can overlay historical data and stock price to find out what drives stock price - Bloomberg news aggregator provides stock-specific news - Despite information being available, investor might need to perform manual calculations - Software with sophisticated functions like Bloomberg are expensive and not financially accessible to retail investors	Yahoo Finance, Bloomberg, TradingView

MARKET CHRONICLES



Landing Page of the Market Chronicles Application

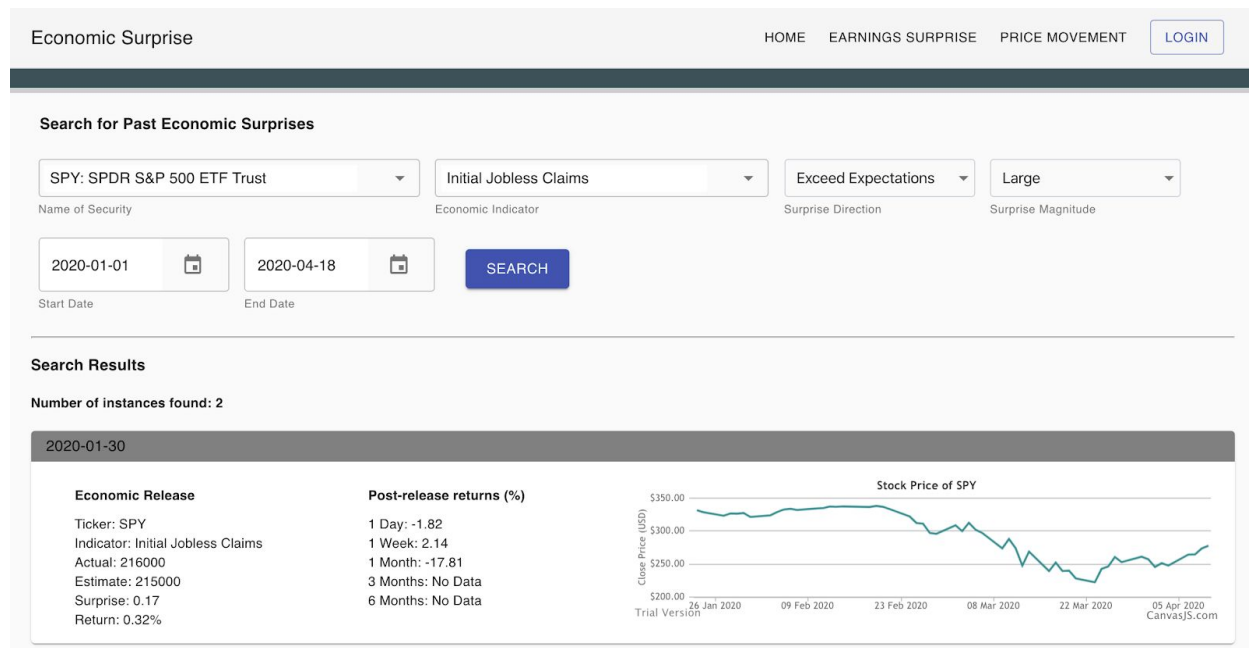
Our empirical research findings have shown that past performance may provide useful clues as to how markets are likely to behave. Furthermore, certain surprises such as earnings surprises seem to have an impact on not only overnight returns, but also price movements in the longer run.

Market Chronicles is a web-based application that seeks to empower retail investors to explore all these relationships through historical data, and help them relive the past they did not live through. The application presents past market performance alongside historical economic and earnings surprises, and allows users to explore events that happened on days of huge market movement. We hope that this will equip investors with the necessary information to see patterns in the past, remove biases in investing, develop market intuition, and most importantly make informed investment decisions.

From the landing page of the Market Chronicles application, users will be able to see at one glance the three different features -- (1) Economic Surprises, (2) Earnings Surprises, and (3) Stock Price Movement -- and a short description accompanying each feature.

By combining these three features in one application, Market Chronicles serves as a one-stop exploratory platform for retail investors to discover patterns in the past and draw conclusions on their own. The application also addresses retail investors' pain points of having insufficient market experience and uncertainty of an event's effect on stock price.

Feature 1: Impact of Economic Surprises on Stock Price



Feature 1: Economic Surprises

The first feature of Market Chronicles allows users to explore the historical price reactions of various financial instruments to macroeconomic surprises. With a macroeconomic indicator in mind, investors can specify the direction and magnitude of surprise to narrow down similar instances in history, and examine how asset prices moved along with these surprises. This will equip investors with a powerful tool to form expectations regarding market reaction post-surprise and factor them into their decision-making process.

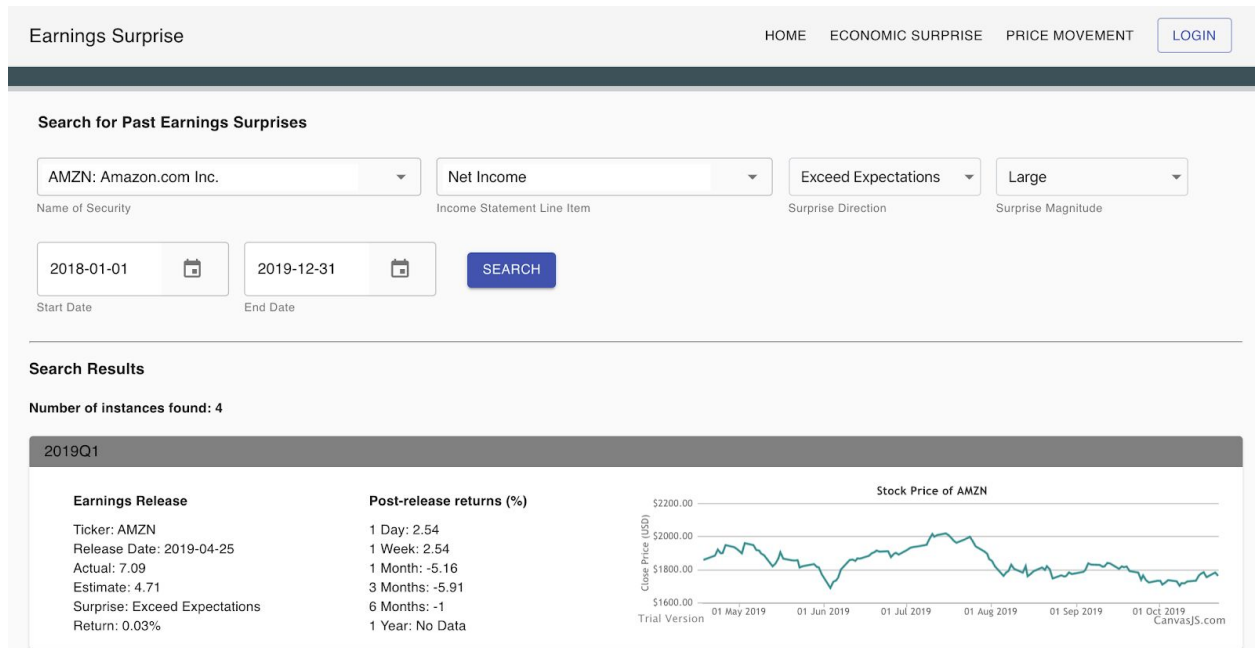
The way we define economic surprise is similar to that used in other research papers (Xin Huang, 2015). Surprises are calculated using the following formula:

$$S_{kt} = \frac{A_{kt} - E_{kt}}{\sigma_k},$$

where A_{kt} is the actual released value for economic indicator k on day t , E_{kt} is the median of analysts' estimates of the economic indicator, σ_k is the sample standard deviation of surprise $A_{kt} - E_{kt}$.

The returned results show details of the instances which match the search parameters, including a drift showing post-release returns, as well as an interactive price chart of that particular stock.

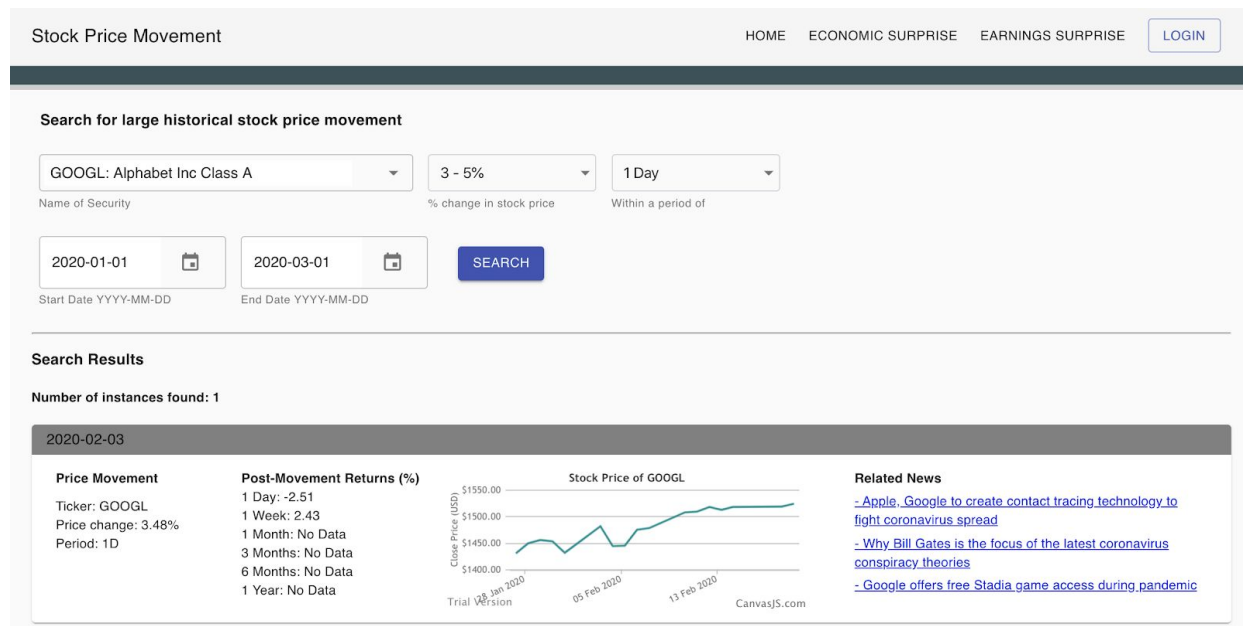
Feature 2: Impact of Company Earnings Surprises on Stock Price



Feature 2: Company Earnings Surprises

The second feature of Market Chronicles is similar to the first in terms of functionality, except that instead of looking at economic surprises, we now look at company earnings surprises. Users can search stock price movements given a specified company earnings surprise level and other input parameters. Earnings surprise here is defined using the same method as economic surprise in feature 1. By studying patterns from past price reactions, investors will then be able to form evidence-supported views when trading on earnings surprises.

Feature 3: Stock Price Movement



Feature 3: Stock Price Movement

In this third feature, investors can search for similar points in time where a stock exhibits a specified movement in their price level. With our interactive graphs, they can explore and track price movements following that price change over a day, month or year. Significant news headlines on the corresponding day(s) will also be generated to give some market colour. A third-party news Application Programming Interface (API) is used to produce these news, which are filtered and ranked based on reliability of the sources and impact of the news.

This feature is useful when the event is unknown during a large price movement. In addition, according to our market survey, 51% of the respondents indicated that one of the challenges faced in investing is uncertainty of an event's impact on the stock prices; while 41% stated they are unsure of what causes stock prices to move. Therefore, this feature will provide a good starting point for investors to dig deeper into various factors that drive price movement.

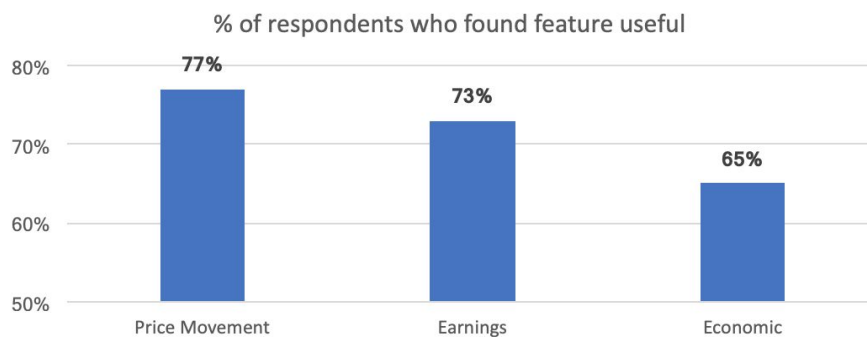
APPLICATION RECEPTION

After developing our application, we have conducted a survey to find out the user reception and obtain feedback for further improvements.

Generally, there was positive reception to the application. 78% of respondents indicated that they were likely to use the application to assist them in investment decisions, and 70% felt that the application was sufficient in addressing their current investment needs. When probed deeper regarding what they specifically liked about our application, the following comments were given:

- ❑ "Fetching specific scenarios automatically as it's **difficult to sieve out these information manually** through search engines."
- ❑ "The ability to **consolidate all information** into one app makes it easier to glance all at once."
- ❑ "The functionalities are very **user-friendly** for beginners."

However, we do note that certain features were more popular amongst our respondents. Out of the existing 3 features, the price movement feature appeared to be most useful to retail investors.



FUTURE DEVELOPMENT

Improved data

Higher frequency data. To enable investors to look at price reactions within the day of surprise release, higher-frequency data such as intraday stock prices can be utilised. This is because most market responses are short-lived - especially for the price reaction towards macroeconomic surprises. Therefore, it can be hard to detect market responses using daily or other lower frequency data.

Live releases. Macroeconomic and earnings surprises can be incorporated live into our application upon release, so that investors can access the most updated information.

Expanding universe. We can expand our universe by including equities beyond S&P 500, other asset classes, or other macroeconomic indicators.

Enhanced features

Additional line items. For our Earnings Surprises feature, financial statement line items other than Net Income can be added to our application. Sector-specific performance metrics can also be included, such as ARPU for subscription services, and Average Conversion Rate for E-commerce. This would enable a more nuanced and relevant search for the investors depending on the stock's sector.

More events

Qualitative events. As our application becomes more sophisticated, machine learning algorithms and natural language processing capabilities can be added to include a search function for qualitative events. Users would be able to search for the stock price performance by simply typing in the event name. For instance, “fed rate cut” or “iPhone release”.

Economic regimes. We can also expand our application to include a search for similar economic regimes in the past. Economic regimes appear to be a major driver of returns, as asset classes respond differently to different economic drivers, and asset class behavior varies significantly over different economic regimes (Masih and Sheikh, 2011). Thus, this function would complement existing functions of our application and be a beneficial addition to the investor’s toolkit.

Making recommendations

Buy/sell recommendations. Currently, our application attempts to assist investors by providing past instances which fit their search criteria, as well as the corresponding price reaction. We can further add value by suggesting to investors a buy/sell recommendation, which will be based on the chances of the stock price rising or falling aggregated from the past instances returned by our application.

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