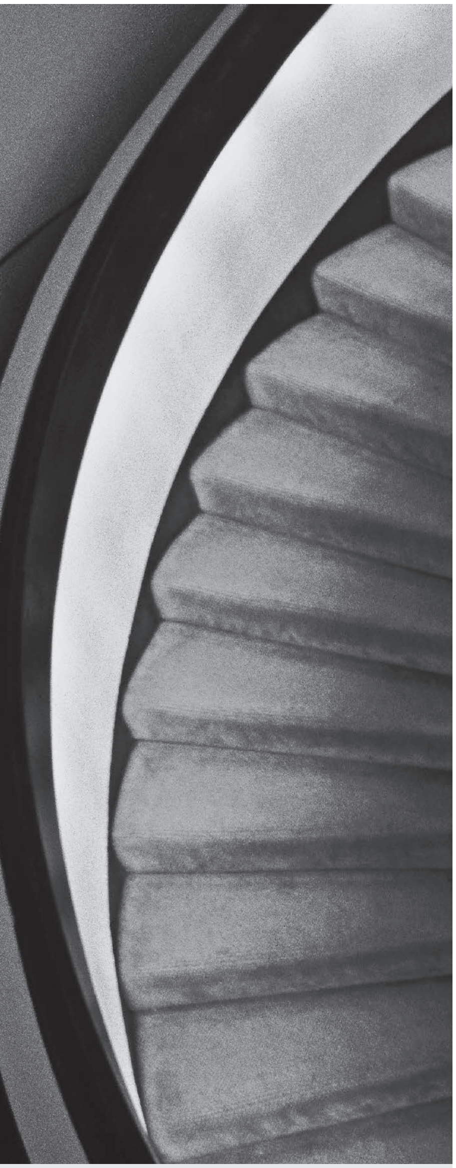
SPECIAL REPORT:

Investing in a High-Frequency Trading Environment

Hurdles to Market Efficiency



Author: Prof. Amin Rajan

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CREATE-Research
Vauxhall Lane
Tunbridge Wells TN4 0XD
United Kingdom

Telephone: +44 1892 526 757
Email: amin.rajan@create-research.co.uk

Michael Lewis' runaway bestseller *Flash Boys: A Wall Street Revolt* has touched a raw nerve in investors.

While exposing high-frequency trading (HFT) as a predatory device, the book pushes to the fore two questions long simmering in the background:

- **How viable are stock markets today as efficient vehicles for channelling capital to productive enterprises, while allowing savers to build their retirement nest eggs?**
- **Are recent cases of blatant abuses, revealed by the Madoff scandal and high-profile insider-dealing cases, merely the tip of the iceberg?**

These doubts have turned more vocal, owing to the unintended consequences of two sets of market reforms on both sides of the Atlantic.

In America, the Securities and Exchange Commission (SEC) created the *Regulation National Market System in 2005.* It consolidated a raft of rules to ensure that investors receive the best-price execution for their orders via increased competition in the market place.

It also mandated that stock prices at the end of each trading session are consolidated in the national ticker tape, reporting all transactions of listed companies on all public exchanges as well as over-the-counter securities markets. Similarly, in Europe, the 2007 *Markets in Financial Instruments Directive* set out to deliver competitive charges for investors by encouraging the growth of unlisted markets.

In their wake, two unintended practices have evolved to create an uneven playing field. One is HFT, which deploys high-speed computer algorithms to create a microsecond trading advantage. The other is so-called dark pools, which use electronic networks to enable investors to do block trades anonymously.

Both have their virtues. Used in excess, however, these are turning into vices.

Accordingly, this special report pursues two issues:

- **What are the key forces that investors see as detrimental to the efficiency of financial markets today?**
- **As a result, how are their investment behaviours changing?**

These questions were covered in the 2014 Principal Global Investors/CREATE-Research Annual Survey, involving 704 pension plans, sovereign wealth funds, insurance companies, asset managers and fund distributors in 30 countries. Of these, 68 were institutional investors collectively managing assets worth $5.9 trillion.

During the fieldwork of the survey, the topic of the impacts of HFT was a priority issue, hence the focus of this report.

THIS SPECIAL REPORT FOCUSES ON THREE HEADLINE MESSAGES THAT EMERGED FROM OUR SURVEY AND INTERVIEWS.

1. There is a widespread belief that stock markets are stacked in favour of high-frequency trading firms

The efficiency of stock markets has been eroding since the 2008 crisis. Efficiency is defined here as the capacity to allocate capital to its productive use via a robust price mechanism that factors in all relevant and known information in real time — without favour.

Four contributing factors were singled out in our survey as either having a negative or positive effect on market efficiency (Figure 1):

- **Insider trading** (59% of respondents cited it as having a 'negative' effect on efficiency and 10% cited it as having a 'positive' effect)
- **Proliferation of off-exchange trading avenues like dark pools** (55% 'negative' vs. 18% 'positive')
- **High-frequency trading** (52% 'negative' vs. 19% 'positive')
- **Going from capital allocation to financial trading** (49% 'negative' vs. 10% 'positive')

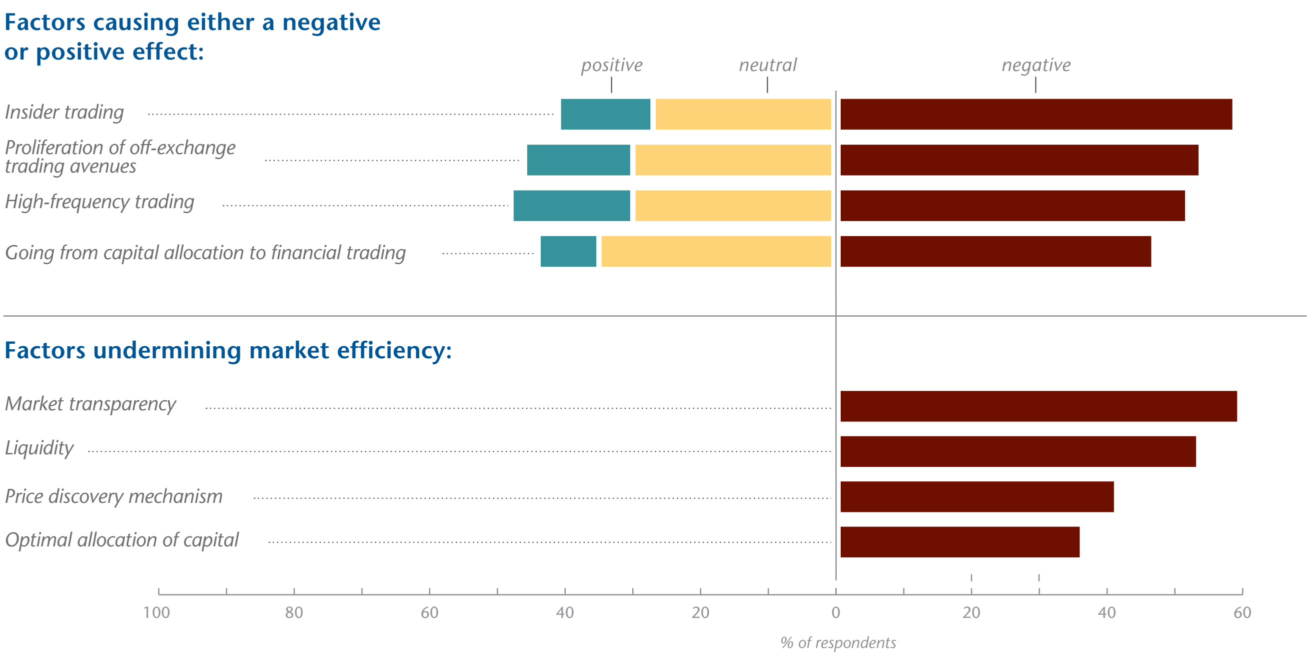
In turn, these factors are undermining four key aspects of efficiency (Figure 1):

- **Transparency** (58%)
- **Liquidity** (54%)
- **Price discovery mechanism** (41%)
- **Optimal allocation of capital** (36%)

The erosion is part of a circular and cumulative process. Directly, it undermines market integrity. Indirectly, it hurts value investing. To start with, market manipulation is as old as the markets.

What is different now is its newest source: ***the unintended consequences of new regulation referred to on page 1.*** The key triggers lately have been **HFT** and **dark pools.**

FIGURE 1



Source: Principal Global Investors / CREATE-Research Survey 2014

High-Frequency Trading

According to proponents of HFT, it provides liquidity, keeps down trading costs, assists price discovery, and performs the market-making function. Their opponents — the majority — disagree. To them, HFT is all about front-running the trades and profiting from inter-exchange price arbitraging. It has nothing to do with market making. Indeed when markets turn volatile, high-frequency traders are usually the first to cancel their orders and rush for the exit. They do not have the affirmative obligation of usual market makers, who step in as the "buyer or seller of last resort" in good times and bad.

In 1999, at the height of the tech craze, there were 1,000 quotes per second among all the U.S. exchanges. Now it is over 2,000,000. Over 90% of them emanate from HFT with no corresponding increase in share volume.

The May 6, 2010 "flash crash" was a salutary reminder, if one were needed, of how markets are now prone to damaging tipping points. The immediate bounce-back in the Dow Jones Industrial Average after its 998 point plunge offered little comfort to investors whose stop-loss mechanisms were automatically activated.

Worse still, had the crash happened a little later in the day, prices would not have had the chance to recover before the U.S. markets closed, potentially causing carnage when the Asian and European markets opened the next day.

"Trading for its own sake has superseded investing in the equity markets, giving rise to all manner of abuses."

— An interview quote

"Dark pools are victims of their own success. They execute at better prices than those of open exchanges at much lower costs. But rising volume has come at the expense of transparency."

— An interview quote

Dark Pools

Moving on to dark pools, these solve the age-old problem of how to handle block trades without moving the price. They started as safe havens for buy-side investors, where they can trade large volumes of stocks without being detected by the high-frequency traders who often leapfrog their orders on public exchanges.

However, their opponents — the majority — believe that dark pools drain liquidity from public exchanges. More importantly, they distort price discovery by withholding the data on their trades. This forces investors to trade on "stale" prices on the public exchanges until they close.

After all, trading is the process that incorporates newly available information into market prices in real time. Besides, the average trade size in dark pools has fallen to 200, making dark pools less regulated versions of public exchanges.

In sum, both HFT and dark pools are part of the circular process that is resulting in the over-financialization of markets; with a growing decoupling of stock markets from the real economy. Stocks and their derivatives are meant as claims on viable businesses. But trading in claims themselves has become more rewarding. This cumulative process is also a factor in insider trading.

2. Investors no longer manage risk, they manage uncertainty

Macro events — like excessive leverage in the aftermath of the 2000-2002 bear market and quantitative easing programs in the wake of the Lehman collapse — have sidelined for now the conventional investment wisdom on risk premia and diversification.

After a "lost decade," investing is less about managing risk on the basis of known probabilities of outcomes and more about navigating uncertainty via trial and error.

The recent erosion of market efficiency is thus seen as yet another factor denting confidence in two key segments (Figure 2). The negative impact is reported in

- **The institutional segmen**t by 51% of respondents
- **The retail segment** by 68% of respondents.

Behind these dry numbers is a sorry tale of how unsuspecting investors are being swept towards practices that are contrary to their best interests. These include: **the adoption of shorter investment time horizons** (58%), **the weakening of buy-and-hold culture** (43%), **stronger herd mentality** (40%), **momentum trading** (31%), and **the search for "hot" products** (30%). See page 11 for a more in-depth look.

Opportunism is on the rise. Age-old notions of time premium and risk premium are on the wane, as are concepts such as mean reversion and diversification.

"Defining high-frequency is the biggest hurdle to regulating it."

— An interview quote

Traditionally, stock markets have been a "voting" mechanism in the short-term and a "weighing" mechanism in the long-term. With so much "noise" generated by HFT, investors are not so sure. Hence, for many investors, dynamic investing is not the first choice, or the last one: it's their only choice.

Value traps are hard to tell from value opportunities.

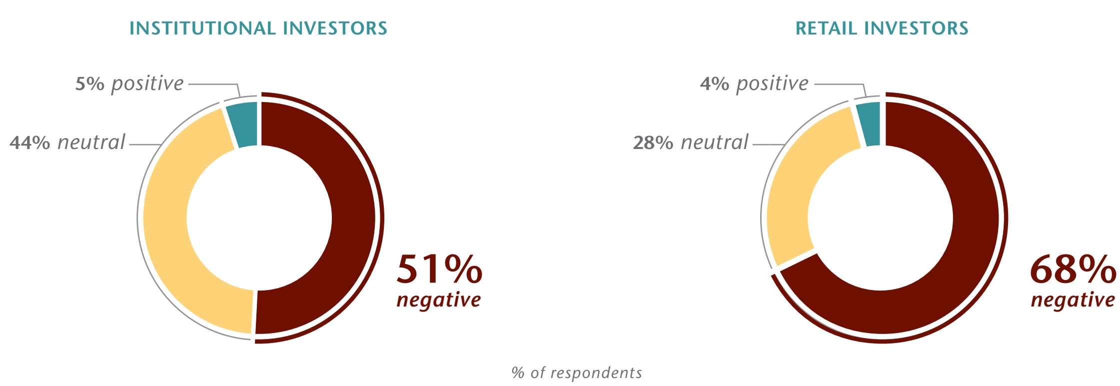
In the meantime, the closure of defined benefits (DB) plans has accelerated in the institutional space. The switch towards passive funds has intensified in the mass market space. Both segments are underweighting in equities.

Investing is perceived as a practice in which the winner is not the one with the best investment ideas, but the one who can front-run with the fastest technology.

This favours traders at the expense of investors.

FIGURE 2

The corrosive effect on market efficiency has dented confidence in two key investor segments:



Source: Principal Global Investors / CREATE-Research Survey 2014

3. Without regulatory action, investing risks morphing into trading

With the blurring of boundaries between trading for quick gains and investing for sustained returns, there are growing doubts amongst investors whether today's stock markets have the inherent power to deliver value in the long-run.

This new paradigm of ultra-fast opaque investing thrives in the grey area of trading ethics. It over-promotes trading for its own sake in ways that generate huge wealth for the few at the expense of the many. It's all OK, as long as the letter of the law is observed, no matter the intent behind it.

"Ultra high-speed trading is a fact of life. The genie is out of the bottle. The challenge is to minimise its abuse."

— An interview quote

Still, the genie is out of the bottle. Both HFT and dark pools are facts of trading life. The best that regulators can do is to step-up their oversight and have tighter enforcement of the existing rules to ensure that the spirit behind them is observed.

In Europe, new rules are being planned. For HFT, they envisage "circuit breakers". For dark pools, they envisage two changes. First, a cap on the trading volume at 8% of the total amount of a stock traded in the European Union. Second, a stipulation that prices of stocks traded in a dark pool have to be better than on public exchanges, as is the case in Australia and Canada.

In the United States, Mr. Lewis's book has been a wake-up call. The Security Exchange Commission (SEC) has promised a "soup-to-nuts" review of HFT, in the words of Chairman Mary Jo White (Financial Times, April 13, 2014).

The Financial Industry Regulatory Authority, too, is conducting a special investigation into dark pool and off-exchange trading.

It is hard to believe that nothing will change after all that has happened. Already, large U.S. asset managers are now considering creating a joint equity trading platform to counter the worst excesses of HFT.

Only time will tell whether these regulatory and private initiatives will make a difference.

Part of our recent survey work explicitly sought to uncover the extent to which stock markets on both sides of the Atlantic have been distorted by various recent developments.

Research shows that there is a widespread belief that markets are not only stacked in favour of high-frequency trading firms, they are also losing their time-honoured role of channelling capital to growing businesses. Three aspects of market efficiency have especially come under challenge: transparency, liquidity and the price discovery mechanism. Consequently, mainstream investors see the odds stacked against them.

Findings supporting these headline messages are elaborated in the following section.

DETAILED ANALYSIS OF MARKET DISTORTIONS AND THEIR IMPACTS

The manipulation of markets is as old as the markets themselves. What distinguishes it now is its latest source: the unintended consequences of new regulation.

Our research identified the factors that distort the efficient working of stock markets in the West since the 2008 crisis. They fall into two groups.

The first group covers regulatory changes. These include two types of measures: ones that permit HFT and dark pools on both sides of the Atlantic, as outlined earlier in this paper; and the Volcker rule, which seeks to isolate banks' market-making activities from proprietary trading and bans the latter.

The second group covers the over-financialization of markets caused by their ever-changing focus from capital allocation for future business growth to financial trading for immediate gains, while giving rise to insider trading.

Over-financialization has also caused a growing decoupling of equity markets from the real economy, giving rise to new sources of capital outside the traditional financial markets; for example, private equity, senior loans and mezzanine finance.

Our survey respondents have identified seven factors falling into these two groups (Figure 3). Each has positive and negative impacts on market efficiency — directly or indirectly, now or in the near future.

"The Volcker rule is not a cure-all for Wall Street. It is having a negative effect on banks' appetite to warehouse risk."

— An interview quote

Within the regulatory cluster, three items were identified by our survey respondents, each one scoring more "negatives" than "positives":

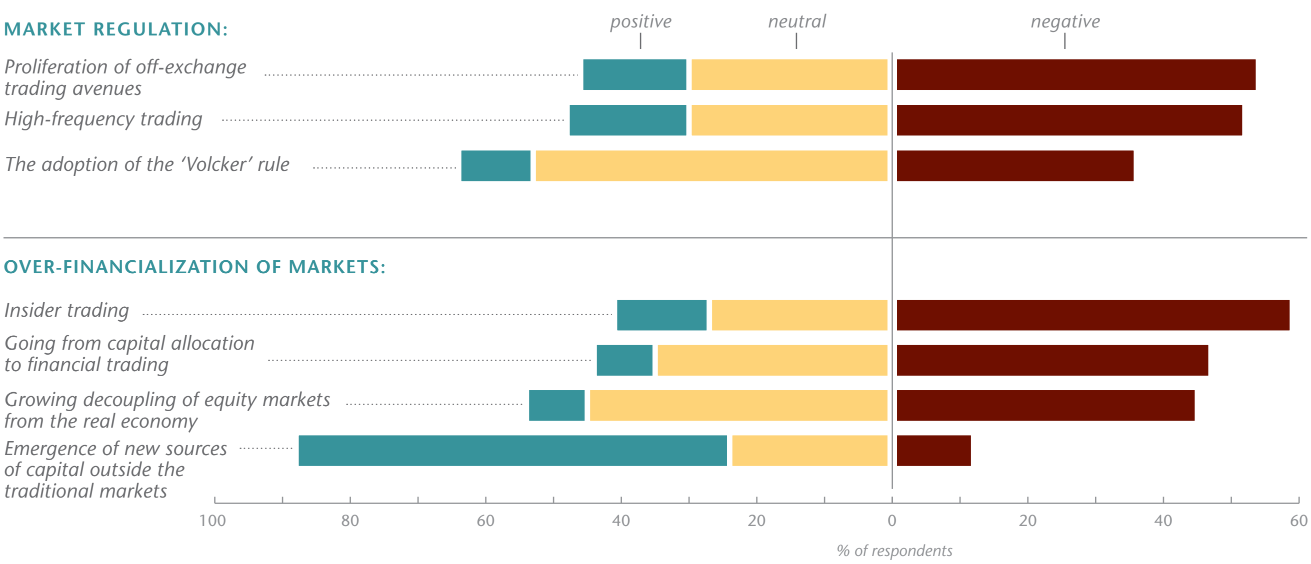
- **Proliferation of off-exchange trading avenues like dark pools** (55% negative vs. 18% positive)
- **High-frequency trading** (52% negative vs. 19% positive)
- **The Volcker rule** (37% negative vs. 19% positive)

In each case, our survey respondents have also identified their pros and cons.

HFT is seen as providing liquidity via its huge trading volumes, keeping down trading costs by promoting competition between exchanges, assisting price discovery by incorporating newly available information into stock prices in real time, and performing a market-making function. But its detractors contend that HFT is all about front-running the trades or profiting from inter-exchange price arbitraging, and nothing to do with market making.

FIGURE 3

What is or will be the impact of various recent developments on the efficiency of stock markets?



Source: Principal Global Investors / CREATE-Research Survey 2014

Similarly, advocates of dark pools contend that they provide safe havens for investors needing to trade large volumes of stocks without moving the markets against them. They also minimize trading costs via direct competition with listed exchanges. But their detractors see dark pools as draining liquidity from public exchanges and distorting price discovery by keeping the trades secret until the end of the trading day.

Finally, advocates of the Volcker rule make two contentions, both of which are disputed by its detractors.

First, by prohibiting propriety trading by banks, the rule will ensure greater financial stability. Second, by separating market making from proprietary trading, banks will be able to carry on their time-honored role as the "buyer or seller of last resort" for various instruments.

An uneven playing field gives rise to the perception that stock markets are stacked in favour of high-frequency trading firms.

But its detractors contend that, running to 1,000 pages, the rule is so complex that this separation will be hard to achieve in practice without enormous cost and litigation. In any event, liquidity will suffer.

Turning to the second group — over-financialization of markets — four items were identified:

- **Insider trading** (59% negative vs. 10% positive)
- **Growing decoupling of capital markets from the rest of the economy** (45% negative vs. 8% positive)
- **Going from capital allocation to financial trading** (49% negative vs. 10% positive)
- **Emergence of new sources of capital outside the mainstream financial markets** (12% negative vs. 67% positive)

These items are interrelated. Over-financialization has promoted trading to the detriment of investing, resulting in a decoupling of the equity markets and the rest of the economy. Thus, firms have been forced to seek alternative sources of funding for growth that is beneficial to them, but damaging to the integrity of stock markets.

INSIGHTS

High-frequency trading is neither good nor bad per se. Like other financial innovations, it has its virtues, limits and "health warnings". Lately, its high-tech wizardry has outpaced high regulatory oversight. Instances of misuses and abuses have been mounting. In the U.S., 66% of stock trades were executed by HFT in the period 2008-2011. Now it is down to 50%. In 2009, HFT moved about 3.25 million shares a day. This has halved since then. Yet, that has not reduced its capacity to front-run the trades. In 1999, for example, at the height of the tech craze, there were about 1,000 quotes per second among all the U.S. exchanges. Now it is 2,000,000. Over 90% of quotes emanate from high-frequency traders, with no corresponding increase in share volume. The story is much the same in other markets like Australia, Canada, and Europe — albeit on a smaller scale. Proponents of HFT contend that they provide liquidity, keep down trading costs, assist price discovery and perform the market-making function. Yet, when markets turn volatile, high-frequency traders cancel their orders, pack up their bags, and rush for the exit. Prices can drop like a stone, as they did on May 6, 2010.

Yes, these traders are the new market makers but with one big difference: they have no affirmative obligation of traditional market makers, who invariably step in as the "buyer or seller of last resort" in exceptional times. In contrast, being able to see what trades are being placed, these traders jump the queue, front-run those investors who have placed the trades and profit at their expense. Indeed, when high-frequency traders buy stock, they ensure that there are other bids to buy behind them. If they can't sell it at the offer price, they just sell the stock to other bidders at the same price they bought it and cancel the trade. Thus they ensure that there are plenty of real bids or offers in the queue to "lean on"; hence, the widespread perception that they "rig" the markets.

So, the best that regulators can do is to implement extra safeguards in an ever-more complex digital trading that is too prone to glitches. The recent reforms proposed in Europe — for example, the use of "circuit breakers" when price volatility overshoots the pre-set limits — is a step in the right direction.

On their part, large U.S. asset managers are planning to create a joint equity trading platform, in response to the technological arms race started by HFT. The fragmentation of stock trading across 13 public exchanges and 50 alternative venues has done more harm than good for buy-side firms like us.

— A U.S. Asset Manager

Impacts to Market Efficiency

From the investor perspective, the aspects of market efficiency that are being undermined, fall into two groups:

- Unfettered functioning of financial markets
- Optimal allocation of assets.

Taking them in turn, three aspects are singled out as being undermined in the first group (Figure 4):

- **Market transparency** (cited by 58% of respondents)
- **Liquidity** (54%)
- **Price discovery mechanism** (41%)

HFT is seen as reducing transparency by buying preferential access to market-moving press releases, submitting and canceling trade orders to "fool" the market and having foreknowledge of the trade queue.

The same applies to dark pools. Their lack of transparency, however, forces investors to trade on "stale" prices on the public exchanges until they close.

Both HFT and dark pools are undermining the market-making function that provides liquidity in good times and bad. In times of extreme stress, they amplify volatility by withdrawing liquidity. Worst of all, by concealing their trades, they also hinder price discovery by ensuring that the latest information implicit in the trades is not incorporated into prices in real time.

Equity markets are no longer seen as principal conduits that channel capital to productive enterprises

Unfettered functioning requires that all market participants should know the scale of trades taking place, their originators, their prices and the latest market information on which they are based. In other words, as informed buyers and sellers making rational choices, market participants need to know who is doing what, how, when and why.

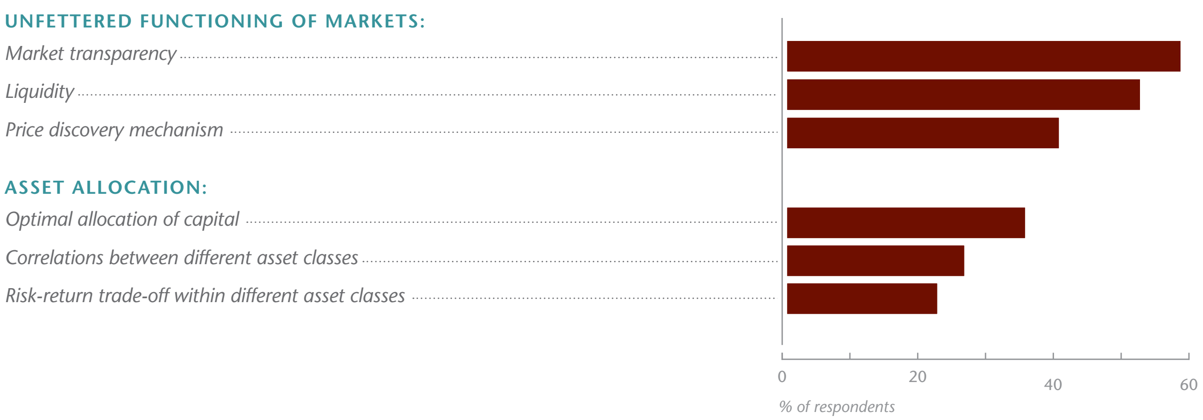
Turning to the second group, asset allocation, three aspects are being undermined, according to our respondents:

- **Optimal allocation of capital** (36%)
- **Correlations between different asset classes** (27%)
- **Risk-return trade-off within equity asset classes** (24%)

Since their origin in the 17th century, stock markets have been seen as a "voting" mechanism in the short-term and a "weighing" mechanism in the long-term. The underlying idea is that markets are moved by random "noise" as much as intelligent "signals". Without overt distortions, signals overwhelm noise, and intrinsic value triumphs in the end.

FIGURE 4

Which aspects of market efficiency are most affected by the identified distortions?



Source: Principal Global Investors / CREATE-Research Survey 2014

With HFT accounting for up to 70% of trading volumes in some markets; however, the noise–signal ratio has shot up, undermining the capital allocation role of markets.

Many investors find it hard to accept that intrinsic value will always triumph in the end.

Indeed, many institutional investors in America, Asia and Europe participating in our post-survey interviews fear that markets are turning into legalized casinos driven by ultra-high-speed gizmos beyond the reach of mainstream investors. The resulting class system creates the haves and the have-nots.

Additionally, investors are also concerned that, without freely functioning markets, asset allocation has become ever-more challenging in two respects: correlation between asset classes is hard to ascertain except over very long periods; and the risk/return trade-off within equity-based asset classes is subject to an unacceptable margin of error.

"Technology has advanced so quickly that oversights have failed to keep up."

— An interview quote

Market distortions are not new. What *is* new is their intensity. The "flash crash" of May 2010 was a salutary reminder, if one were needed, that markets are now much more prone to damaging tipping points.

INSIGHTS

Dark pools are privately run electronic networks that allow investors to buy and sell anonymously. Trade information is hidden before and during trading. Details are made public only after the public exchanges are closed. Once executed, all such trades are reported to the consolidated tape, which provides the latest trade data for all exchange-traded securities.

Dark pools solve the age-old problem of how to handle block trades without moving the price. A trader submits a buy order to a dark pool. If another trader has submitted a sell order, then the trade takes place. If no such seller arrives, the buyer's order remains unfilled and no one apart from the buyer knows of its existence. This invisibility allows large institutions to trade more smartly and cheaply.

For example, a large buy order, for example, can drive up the price of a security as it mops up ever more shares at higher and higher prices. Likewise, a large sell order can depress the prices, as shares are offloaded in tranches. That is why large buyers and sellers have moved to dark pools for block trades. Around 40% of stock trading in the U.S. occurs away from the glare of public exchanges and alternative trading systems. Around 15% of it now occurs in dark pools. The corresponding figure in Europe is 10%.

Like HFT, the merits and demerits of dark pools are debatable. They started as safe havens, where buy-side investors could trade large volumes of stocks without being detected by the high-frequency traders who often leapfrog orders on public exchanges and manipulate prices in their favour. Additionally, their competition with public exchanges results in lower prices for all investors. However, dark pools do drain liquidity from public exchanges. They also distort price discovery by withholding the data on their trades. After all, trading is the process that incorporates newly available information into market prices in real time.

Indeed, many market participants now believe that when dark pool trading exceeds 10% of the total volume, the quality of the price discovery mechanism in public exchanges starts to suffer.

Hence in the U.S., the Financial Industry Regulatory Authority is now conducting a special inquiry. Regulators in Europe, on the other hand, have already proposed to cap the trading volume in dark pools at 8% of the total amount of a stock traded in the European Union. In Australia and Canada, trading in dark pools is permissible only so long as the price of shares traded there is better than on public exchanges.

On their part, public exchanges contend that the average trade size in dark pools has fallen to 200, making dark pools less regulated versions of public exchanges. Hence, they are lobbying for a "trade-at" rule, requiring brokers to route an order to an exchange unless they can improve on the best public quote by a given amount. Canada imposed such a rule in 2012; since then, quoted spreads have narrowed and volatility has dampened.

— A European Pension Plan

The Rise of Herd Behaviors

Since the 2000-2002 bear market, macro events have served to disconnect stock prices from their underlying value drivers. To start with, excessive leverage in the aftermath of the tech debacle not only made the risk–return features of asset classes more unpredictable. It also weakened the time-honored benefits of asset class diversification.

As if that were not enough, the debt crisis since 2008 has sparked unusual market volatility. In its wake, the quantitative easing programmes of central banks on both sides of the Atlantic have sought to stave off a global depression by creating the "wealth effect" to boost growth, investment and jobs. But as an unintended consequence, they have driven an even bigger wedge between market prices and their underlying value drivers.

Investors worldwide now find that they no longer manage risk, they manage uncertainty. One is about acting on the basis of known probabilities of outcomes, the other is guesswork. Asset allocation perforce has gone dynamic.

Institutional investors are also raising the bar by adopting new approaches such as risk parity, smart beta and risk-based diversification. Mass market investors, too, are switching to advice-embedded products such as target date funds and diversified-income funds.

However, in each segment, a big doubt lurks in the background: with all these distortions, can stock markets be relied upon to deliver long-term investment goals?

"Transparent trading lies at the heart of price discovery. A lot of trading now relies on 'stale' prices."

— An interview quote

Mainstream investors see the odds stacked against them

When assessing the impact of the distortions (covered in Figure 3 on p.6) on their asset allocation decisions, at least one in four respondents cited the following (Figure 5):

- **Adoption of shorter time horizons** (56%)
- **Factoring in higher volatility** (46%)
- **Coping with the disconnect between market prices and their intrinsic value** (43%)
- **Weakening of buy-and-hold investing** (43%)
- **Stronger herd mentality** (40%)
- **More momentum trading** (31%)
- **Increased search for "hot" products** (30%)
- **Reduced benefits from diversification** (28%)

The upshot is clear. First, investors are becoming more short-termist when allocating their assets. For long, the bedrock of investing, the buy-and-hold culture is weakening as investors are obliged to adopt shorter horizons. Investing is fusing with trading. It is no longer a bet on an unknown future. Notions like time premium and risk premium are weakening; as are concepts like mean reversion and diversification.

Second, the ever-higher velocity of trades is promoting an environment of herd mentality and momentum trading. Investors end up acting in ways that are contrary to their best interests.

Finally, this new paradigm of ultra-fast opaque investing implicitly thrives in the grey area of trading ethics, where the line dividing right and wrong is blurred. *Everything is fair game so long as nobody complains. Everything is OK if competitors are also doing it. Everything is OK as long as the letter of the law is observed.* The intent behind it is another matter altogether.

Some 70% of equities worldwide are owned by pension plans and mass-market investors. Operating as fragmented units, most of them engage in investing to provide retirement income.

"Dark pools pose potential for abuse. Better rules can make them work as originally envisaged. After all, the trading opportunities they offer are difficult to match elsewhere."

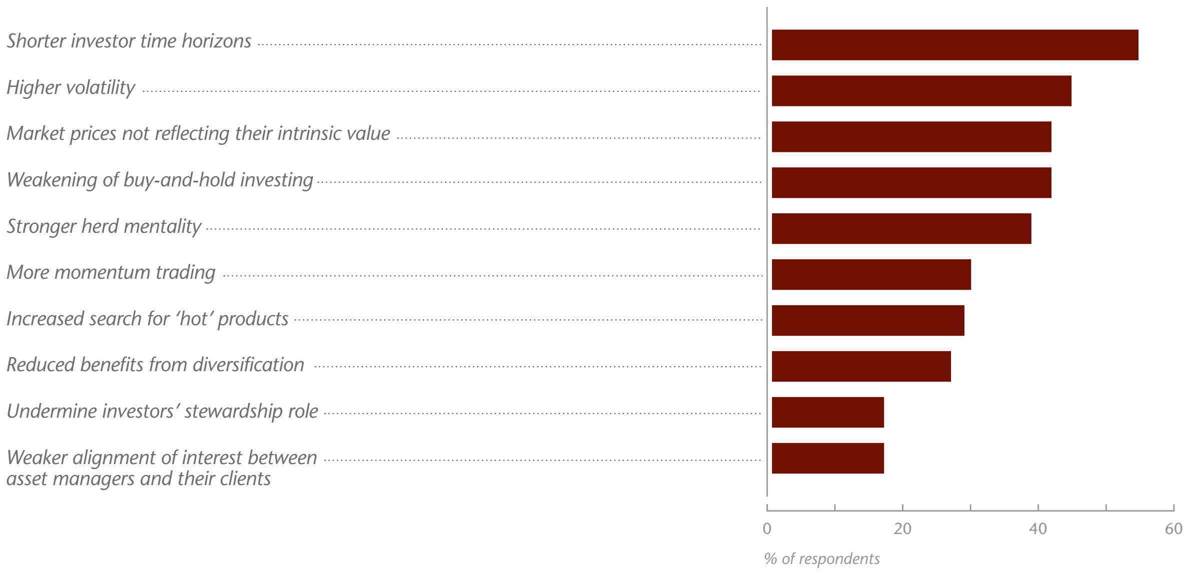
— An interview quote

They want regulators to stamp on the blatant abuses identified in this report in order to ensure market integrity.

These especially concern high-frequency trading. It is here to stay, but not in its current form.

FIGURE 5

How are the identified distortions affecting asset allocation by investors?



Source: Principal Global Investors / CREATE-Research Survey 2014

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