

Opportunistic Trading Seeks to Enhance Performance

By providing liquidity, Dimensional exploits opportunities when buying or selling

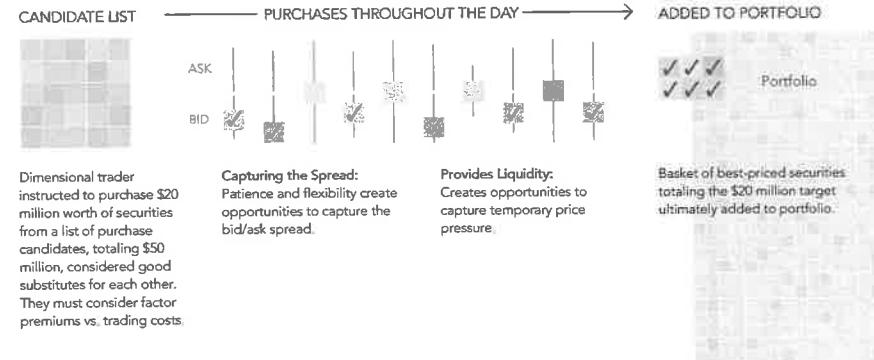


Chart for illustrative purposes only

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Trading Costs Matter

Our approach helps minimize the total costs of trading

- 4 trading and portfolio management desks cover the global equity markets in real time.

- Traders use Direct Market Access (DMA) when available to maintain full control of trading process.



Dimensional's Value Added through Trading

Third-party trade cost analysis results across all segments of the market

ITG POST-TRADE ANALYTICS™ ALPHA CAPTURE ^{1,2}			
Strategy	Trading Costs (gain/loss)		
	Median Peer	Dimensional	Dimensional Rank ³
US Large Cap Trading	-26 bps	+35 bps	100%
US Small Cap Trading	-59 bps	+102 bps	100%
All Developed Markets Trading ²	-47 bps	+75 bps	100%
All Emerging Markets Trading	-64 bps	+85 bps	98%

¹ Percent of peer universe Dimensional outperforms in terms of trading costs. ² US trading included in results only for portfolios with global mandates. This information on this slide was provided by Investment Technology Group solely for Dimensional's use and not for any other third party. These materials are highly confidential and are not to be copied, displayed, or transmitted in any form without the prior written permission of Investment Technology Group.

Seizing Opportunities to Add Value

Providing liquidity gives Dimensional an advantage across markets

Market Cap Range (millions USD)	Names	Percent of Market Cap (%)	Average Bid/Ask Spread (%)	Average Daily Trading Volume per Issue (USD)
UNITED STATES				
> 5,000	528	85.3	0.06	175,419,527
1,500–5,000	592	9.9	0.12	24,706,028
500–1,500	618	3.4	0.23	6,481,501
200–500	521	1.0	0.58	1,577,373
50–200	583	0.4	1.77	292,523
INTERNATIONAL (23 markets)				
> 5,000	635	81.5	0.13	49,503,008
1,500–5,000	790	11.5	0.27	7,736,925
500–1,500	1,054	4.8	0.50	2,001,487
200–500	1,020	1.7	0.80	593,796
50–200	844	0.5	1.34	239,780
EMERGING MARKETS (20 markets)				
> 5,000	379	71.5	0.24	24,797,286
1,500–5,000	515	16.6	0.38	6,108,915
500–1,500	684	7.0	0.52	2,587,511
200–500	769	3.2	0.67	1,291,908
50–200	1,018	1.6	0.68	880,894

¹ US data as of November 3, 2012. Data provided by ITG. © 2013 ITG LLC Incorporated and its subsidiaries. All rights reserved. International and emerging markets data as of November 15, 2012. Data provided by Bloomberg. Developed international markets are Dimensional's eligible universe (Canada, Europe, Japan, Asia Pacific, UK). The analysis spans a generally weighted as an evaluation of the cost of liquidity.

MARKETS

Block Trades Build Steam as IPOs Stall

Moving large bundles of shares has become a brisk business for deal-starved banks

Just before the Thanksgiving holiday, Morgan Stanley bought about three million shares of insurer James River Group Holdings Ltd. from hedge fund D.E. Shaw Group. Its intention was to resell the shares at a profit before the market opened the next day.

By Maureen Farrell,
Corrie Driebusch
and Matt Jarzemsky

It is unclear exactly how Morgan Stanley did on the roughly \$117 million purchase. It stood to make \$1 on every share it sold on to investors, Dealogic estimates, but it isn't known how many it unloaded.

The so-called block trade drew attention on Wall Street, not because of the potential profit but because the number of shares was equivalent to more than 30 days of average trading volume in James River stock. In a typical year, traders say, a bank would rarely buy more than 10 or 20 days' worth of shares, mindful of the risk of being unable to unload them without sustaining a loss.

But it is far from a normal year, and Morgan Stanley isn't alone in taking a more aggressive approach to block trades.

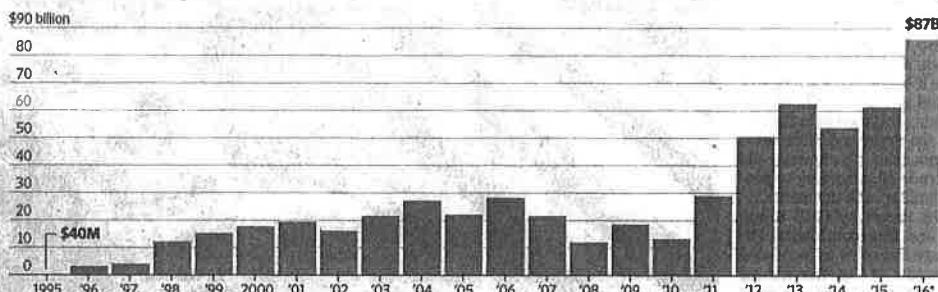
A stalled IPO market has left banks across Wall Street to fight for the deals, which carry lower margins and higher risk than other share sales that form the heart of the equity-capital-markets business.

This year is now the biggest year ever for block-trading activity, with more than \$85 billion worth of U.S.-listed shares sold, according to Dealogic. In all of 2015, the previous record year, there were about \$62 bil-

Trade Surplus

Block-trading volume is surging as revenue from traditional stock sales slumps.

Annual U.S. block trading volume



Top 10 U.S. block trades this year

ISSUER	DATE	VALUE IN BILLIONS OF DOLLARS
Anadarko Petroleum	Sept. 12	2.21
Walgreens Boots Alliance	Nov. 1	1.87
Pioneer Natural Resources	Jan. 5	1.61
Southern	Aug. 16	1.61
NextEra Energy	Nov. 1	1.49
Devon Energy	Feb. 17	1.49
Canadian Pacific Railway	Aug. 3	1.40
Concho Resources	Aug. 15	1.35
NXP Semiconductors	June 6	1.34
Hilton Worldwide Holdings	Nov. 9	1.29

*2016 data for block trading volume and equity capital market revenue are as of Dec. 5.
Source: Dealogic

lion worth of shares sold.

Meanwhile, 2016 is on track to be the slowest for U.S.-listed initial public offerings in 13 years amid factors including a proliferation of attractive private-funding options.

Banks traditionally have served as middlemen in stock offerings, a lucrative assignment in which they line up buyers to purchase shares directly from companies.

It can move the stock, however, the bank faces a possible loss. That makes block trading a riskier proposition for banks than traditional underwriting.

It isn't a mystery why stock sellers like this approach: They are guaranteed a set price, and if the shares subsequently fall, they don't take the hit.

There was \$11.6 billion in stock sold in the U.S. through block trades in November, according to Dealogic. That makes it the third busiest month on record, behind this August and March of last year, which was No. 1.

The rise of block trading

has led to big changes in how companies and investors approach stock sales.

"Sellers' attitudes and preferences have changed. They want price certainty and minimal market risk," said Felipe Portillo, managing director of equity-capital-market syndicate at Credit Suisse Group AG. "Buyers have also learned to be ready and are comfortable making quick investment decisions."

The surge in block trades has dealt a blow to equity-capital-markets desks across Wall Street. Fees in the U.S. are on pace to hit a low of 20-plus years in 2016, according to De-

alogic. Through Dec. 1, banks had generated \$4.9 billion in equity-capital-markets fees this year, down 34% from the same time last year. Block trades accounted for roughly 42% of the business, the largest share ever by a wide margin.

And the field is becoming more competitive, which in some cases has prompted banks to take on more risk facilitating the deals. As block trades become more popular, banks sometimes find themselves in bidding wars to win deals. Before the financial crisis, only a handful of banks participated in the deals, but

now smaller players are getting in on the action too. In November, midsize Chicago bank William Blair & Co. led its first block deal since 2003, according to Dealogic.

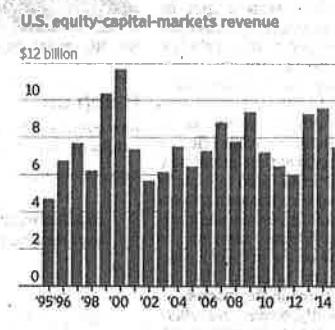
Citigroup Inc. has typically been one of the biggest players in block trades, executing more than \$46 billion worth between the start of 2011 and the end of 2015, according to Dealogic. So far this year, the bank has facilitated roughly \$8 billion in block deals, placing it in sixth, according to Dealogic. Goldman Sachs Group Inc. and J.P. Morgan Chase & Co. are first and second this year, underwriting \$16.5 billion and \$15 billion, respectively, in U.S.-listed block trades.

Rising stocks have helped banks unload recent blocks at a profit, and there are scant examples of big losses. But that could quickly change recent market gains reverse, which in turn could dampen enthusiasm by banks to bid on deals, analysts say.

Indeed, behind many of the recent deals are private-equity firms cashing out. The flood of selling by sophisticated investors could be a sign of a market top—though such firms do face pressure to exit investments and return cash to their backers.

In November alone, KKR & Co. sold its remaining \$1.67 billion stake in drugstore chain Walgreens Boots Alliance Inc., and Blackstone Group LP sold shares of Summit Materials Inc., Hilton Worldwide Holdings Inc., Extended Stay America Inc., Performance Food Group Co. and Hudson Pacific Properties Inc.

Also, if the IPO market returns to more normal levels next year, as is widely expected, block-trading volume could decline somewhat, bankers say. "As IPO volume picks up, people will become more rational," said Mr. Portillo of Credit Suisse.



THE WALL STREET JOURNAL.

Block Trading Booms but Risks Grow

By MATT JARZEMSKY

Facing tighter regulations, Wall Street banks are turning to an old-school way to make a profit: using their own money to help investors sell big blocks of stock.

This boom is coming in the corner of the stock market known as "block trades," in which a bank's capital-markets department buys a slug of stock—sometimes more than \$1 billion worth—from a company or its private-equity backers in the afternoon, aiming to flip it to

money managers after the stock market's close the same day.

For much of the past two years, these bets have had the wind at their backs thanks to strong stock-market gains. There were 48 such deals in the U.S. in the first three months of this year, more than in any first quarter since 1998, according to Dealogic. The offerings raised \$13.2 billion, the second-fastest start to a year on record, behind last year's \$19.3 billion.

But an up-and-down performance in major indexes this spring, marked by a sharp rever-

sal in once-hot technology and biotechnology shares, underscores the risk of the practice.

With prices rising steadily last year, "it was easy to be aggressive," when doing block trades, said Joe Castle, Barclays PLC's head of global equities syndicate. But in 2014, "the market's not going to bail you out, so your mistakes will get magnified," he said.

Lifted by the strong investor demand that has spurred a revival of initial public offerings, a record \$56.9 billion worth of U.S.-based public companies'

stock was sold via blocks last year, up 15% from 2012, according to Dealogic.

Citigroup Inc. managed an industry-leading \$12.9 billion worth of U.S.-based company block trades in 2013, followed by **Goldman Sachs Group Inc.** with \$11.7 billion and **Barclays** with \$10 billion, according to Dealogic.

For example, on March 4, Citigroup bought 15 million shares of Norwegian Cruise Line Holdings Ltd. from the insiders that owned most of the cruise-line

Please turn to page C4

Block Trades Soar But Risks Grow

Continued from page C1

operator. The bank paid \$32.97 a share and reoffered the shares to its clients for \$33.25, making 28 cents on each share it sold, or as much as \$4.2 million, according to regulatory filings.

As is typically the case in these offerings, Citigroup bought the shares for a discount—2.5%—to their latest close, helping its chances of profiting from the deal.

The case illustrates the tricky economics of the block business. The bank took home the "spread" between what it paid and what it sold for, but had to risk nearly \$500 million of its own cash in the process.

"You never know what's going to happen overnight" that could affect stock prices, said Daniel Klausner, a former banker who worked on block trades before moving to FTI Consulting Inc., which advises companies selling shares.

The arrangement contrasts with traditional follow-on offerings, in which the bank acts as a middleman but doesn't buy shares itself. Block trades have become a favored way for private-equity firms to cash out stakes in portfolio companies, months or years after taking these companies public.

"If you're launching a transaction and you know you're getting X price when you sign on the dotted line, that's attractive to the seller" because of the certainty, said Edward Law, a managing director in capital markets at KKR & Co.

This business has had growing appeal for a number Wall Street

firms, which in the wake of the financial crisis, have seen regulators clamp down on other kinds of potentially profitable trading where banks put their own capital to work.

These new restrictions, under the "Volcker rule" section of the Dodd-Frank regulatory overhaul, prohibit banks from making risky bets with their own money but allow certain trades where the bank facilitates selling of assets for a client. As such, underwriters interpret block trades as being permitted in the new regime, bankers and capital-markets lawyers say. A Securities and Exchange Commission spokeswoman declined to comment on whether blocks comply with the Volcker rule.

At the same time, blocks help banks to build relationships with corporate customers, which may lead to further capital-markets and advisory work.

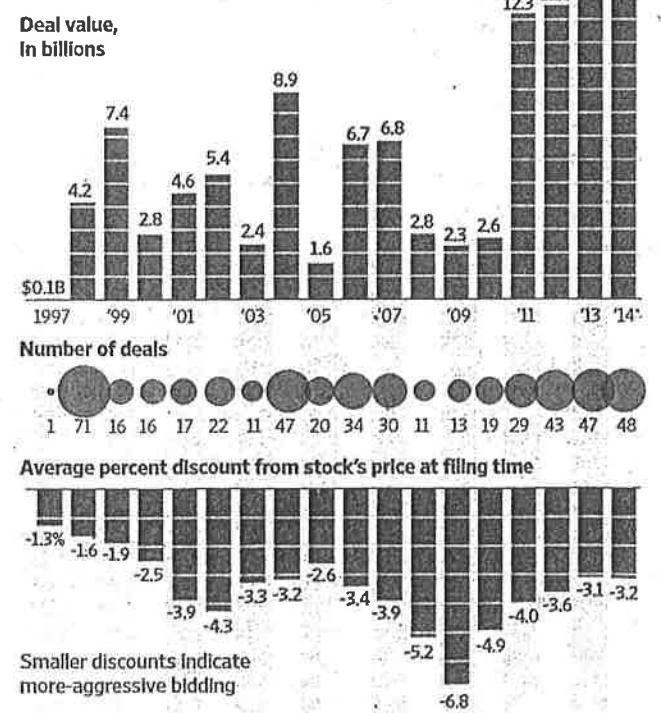
It is unclear how much money banks make or lose on block trades and the exact degree to which banks are left holding shares in the days after a deal.

Among deals that struggled in recent years, Barclays ran a block trade for big holders of Dutch television company Ziggo NV in March 2013 and was left holding a large position. It disclosed a 14% stake valued at €712.6 million (\$984.5 million at current exchange rates), which may also include unrelated trading positions, according to a regulatory filing.

In another deal, **Credit Suisse Group AG** ended up holding some of a \$610 million block of Sally Beauty Holdings Inc. shares

Block Boom

Wall Street firms are handling more so-called block trades of company shares as other banking businesses soften.



*Year to date Source: Dealogic

in July 2012, according to regulatory filings and people familiar with the matter.

Both banks cleared those positions in the following weeks without taking losses, people familiar with the deals said.

Spokesmen for the banks declined to comment.

The "discount" that issuers give banks and investors to the current market price—which provides them some cushion against a potential drop in the shares—was 3.2% the first three months of the year, according to

Dealogic. That is the second-lowest such discount for any year-earlier period since 2005, behind the 2.7% in 2013's first quarter.

The question bankers face is

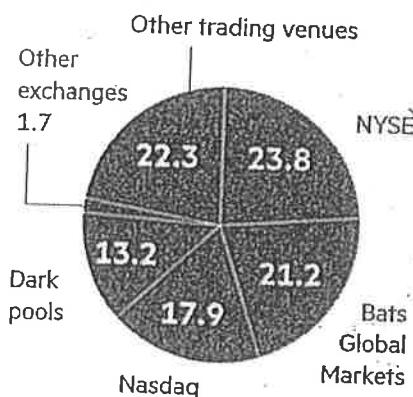
whether the big stock rally of the

past year turns to a more volatile environment, where the discounts don't prove deep enough to absorb losses.

"History has proved, usually pricing continues to tighten until one of the market participants gets hurt," said Bernie Cooney, head of equity block origination at **UBS AG**.

US equity market share breakdown

Per cent



FT March 30, 2016

'Dark Pool' Accords Expose a Dilemma

WSJ 2/2/2016

By SCOTT PATTERSON

The latest round of penalties over "dark pools" highlights how reliant banks and exchange operators have become on business from high-frequency traders—even on platforms that promised to blunt their advantage.

Dark pools were advertised to mutual funds and other traditional money managers as a place where they could trade in secret and avoid giving away their moves to computer-driven traders. New settlements with two of the biggest dark-pool operators, Credit Suisse Group AG and Barclays PLC, showed that the banks were quietly catering to high-frequency traders at the same time.

The reality beneath those practices is that high-frequency traders account for the bulk of bids and offers that keep the market running—about two-thirds of the total—a source of business that can be hard to pass up. Credit Suisse and Barclays catered to them by concealing the role of speedy traders on their platforms and going back on promises to protect clients from predatory trading, according to the settlements with the Securities and Exchange Commission and New York Attorney General.

The often opaque ties between exchanges, dark pools and high-speed firms have been one of the most perplexing issues facing investors and regulators. In recent years, firms accused of masking their

links to superfast trading outfits have been hit with a series of escalating fines.

In 2011, the Securities and Exchange Commission fined Pipeline Trading Systems LLC \$1 million for failing to disclose to clients that they were often trading with an in-house high-speed firm. BATS Global Markets Inc. last year agreed to pay \$14 million to settle allegations that two exchanges it ran failed to disclose certain details about their markets that the SEC said gave advantages to some high-speed traders. UBS Group AG a year ago agreed to pay \$14.4 million to

High-frequency traders account for the bulk of bids and offers.

settle allegations that it failed to inform all clients about advantages its dark pool gave to some firms, including high-frequency traders. Pipeline, BATS and UBS didn't admit or deny the allegations.

The emergence of dark pools and high-frequency trading went hand in hand as trading increasingly shifted from floor-based open outcry models to one controlled by computers.

Trading on dark pools, which, unlike exchanges don't publish buy and sell orders, took off about 15 years ago. Dark pools largely were used by institutional firms hoping

to trade large chunks of stocks without alerting the broader market to their activities.

At about the same time, trading by high-frequency firms also took off. Large traders such as mutual funds grew concerned that high-speed traders were hurting them by detecting their orders on exchanges and trading ahead of them. Many of the firms turned to dark pools, hoping the opaque venues would protect them from such activities.

The problem was that most dark pools also catered to high-frequency firms. Some weren't entirely forthcoming to their clients about their reliance on high-speed traders,

regulators have found. Worse, they told clients they would protect them from predatory high-speed trading while hiding how much of their order flow depended on the firms' frenetic activities.

Credit Suisse and Barclays this week agreed to pay a combined \$154.3 million to settle allegations that they misled investors about high-frequency trading activities on their dark pools.

Barclays told clients that its dark pool, called LX, protected them from predatory trading using its "Liquidity Profiling" system, which it said could detect such activity, according to the SEC. Trades were categorized in buckets ranked from zero to five, with zero the most predatory, and clients could elect to not trade with low-ranked firms.



Credit Suisse said its 'dark pool' would give predatory traders a negative score.

But Barclays often shifted traders assigned a low ranking into a higher ranking, the SEC said. Because of that, certain clients traded with firms ranked "in the most aggressive categories," the SEC said. Barclays also presented marketing material describing the types of clients on LX that omitted its largest subscriber—a high-frequency trader.

Credit Suisse, meanwhile, told clients its dark pool would give predatory traders a negative score, a program "intended to address certain subscriber concerns about interacting with high-frequency trading firms," the SEC said.

Clients could choose not to trade with firms with a bad score. But the system didn't perform as Credit Suisse said it should since it included "significant subjective elements," the SEC said.

The Swiss bank also didn't disclose that it ran a trading system that alerted two high-frequency firms about the existence of orders placed by other clients, the SEC said.

The pros and cons of the rise of dark pools of liquidity

Finance briefing CFA INSTITUTE

The number of equity-market transactions taking place away from public exchanges continues to attract the attention of policymakers and investors. Rhodri Preece discusses this growing trend

What is dark liquidity?

Dark liquidity encompasses trading interest that is not displayed to the market before execution. Such trading mostly takes place away from public exchanges in so-called dark pools and broker/dealer internalisation, although exchanges do facilitate hidden order types as well.

Dark pools are private trading venues that operate with limited pre-trade transparency. They include crossing systems operated by several of the large banks, as well as independently-operated block trading facilities.

Internalisation involves broker/dealers internally executing client order flow against their own accounts on a systematic basis. It represents a form of dark liquidity because broker/dealers acting as over-the-counter (OTC) market makers typically do not have to publicly display quotes, although there are some limited quoting obligations for systematic internalisers in the European Union.

Why do investors use these dark trading facilities?

The primary purpose of dark pools, and dark orders more generally, is to minimise market impact. By restricting access to undesired market participants (such as high-frequency trading firms), and by not revealing quotes, dark pools enable institutional investors to minimise their information leakage and realise more efficient executions. More specifically, dark trading facilities provide the possibility of price improvement and reduced transaction costs by crossing orders at the midpoint of the quoted best bid and offer prices, thereby saving on both the bid-offer spread and on exchange fees.

For these reasons, dark pools have been popular for the execution of large block orders.

How prevalent is dark trading?

In aggregate, non-displayed trading in the US accounts for around a third of total volume, of which dark pools amount to approximately 13 per cent of total volume. A similar volume of dark trading takes place in Europe, although dark pools have a slightly smaller share of total trading activity there. In Australia and some other markets in the Asia-Pacific region, dark pools are starting to gain a foothold as regulators open up their markets to competition.

In the US, dark trading has grown by approximately 50 per cent over the past three years, while in Europe, trading in dark pools relative to order-book activity has more than doubled over the past two years.

What are the reasons for this growth?

Equity markets have experienced a pronounced reduction in order and transaction sizes and significant fragmentation of liquidity across numerous trading venues. These trends have been driven by advancements in technology that have rapidly speeded-up markets and enabled algorithmic trading, and in particular high-frequency trading, to become dominant.

In such an environment, dark pools become relatively more attractive to institutional investors because of the ability to execute large orders over fewer trades while minimising market impact. However, a significant amount of trading in dark pools and through internalisation relates to smaller transactions, because broker/dealers typically route the order flow they handle to their own private pools first, before sending unwanted orders to the public markets. Such pools have become widespread due to technological developments that have lowered costs.

So are these systems the exclusive preserve of institutional investors?

No. Internalisation is the dominant trading avenue for retail orders in the US, driven by the purchase of order flow by OTC market makers from retail brokerages.

Internalisation can provide savings to retail investors in the form of price improvement, but it carries an opportunity cost to liquidity providers who post orders on public exchanges.

Exchanges contend that they operate at a competitive disadvantage to broker/dealers. To better compete, exchanges have sought to launch their own non-displayed trading facilities for retail investors – a prominent example is the NYSE's Retail Liquidity Program, which went into operation last August.

What are the implications of trading in dark pools for markets?

The competition induced by the proliferation of alternative trading venues such as dark pools has been a mostly positive development, as bid-offer spreads and trading costs have fallen. However, exchanges provide a public benefit by facilitating price discovery; if the majority of trading were to take place away from displayed venues, market quality could deteriorate.

Rhodri Preece, CFA, is director of capital markets policy at CFA Institute

Tuesday, January 5, 2016

U.K. Tower Would Aid Speed Traders

BY TIM CAVE
AND JAMES RUNDLE

A Chicago company plans to build a tower in rural England 30 feet higher than London's tallest skyscraper. But nobody will work, live or dine in the Richborough Mast.

Instead, the thousand-foot-plus structure planned for near the Kentish seaside is intended to beam microwaves across the English Channel for high-frequency-trading firms.

Its height will ensure that even the Earth's curvature won't impede its ability to transmit data to continental Europe. Such technology has been deployed extensively by trading firms and exchange groups in recent years to trim microseconds off the time it takes to transmit information.

High-speed traders rely on this information to make a profit, and an advantage of microseconds could mean the difference between profiting from a trade or losing out to competitors.

Vigilant Global, a Canadian telecommunications company owned by Chicago's **DRW Trading**, submitted plans in August 2015 to construct the 320-meter (1,050-foot) mast in Richborough, Kent, according to an application submitted to Dover District Council.

DRW Trading, one of the world's largest high-speed-trading firms, trades on more than three dozen exchanges. It is part of a group of firms that rely on ultralow-latency technology to trade their own capital at high speeds.

According to information provided on a website for local residents by Vigilant, the tower would "provide a new

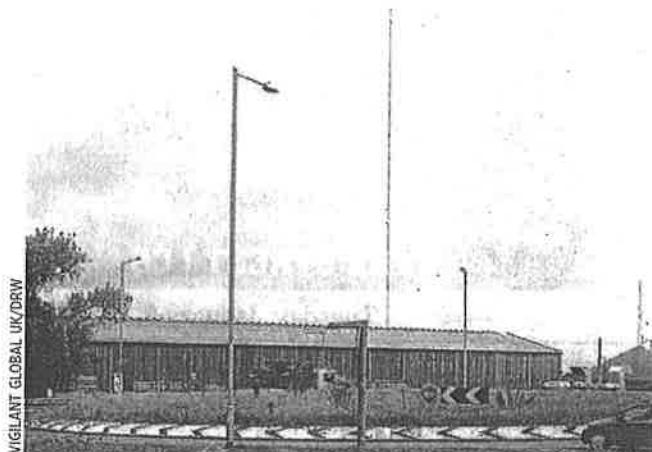
communications point between the U.K. and Europe" with a "completely unobstructed" optical and radio line of sight.

Microwave transmissions through the air aren't affected by the "friction" in traditional wiring that can slow data transmission. But the technology does have drawbacks: The transmitters and receivers must have line-of-sight contact, meaning engineers must factor in the curvature of the Earth when deciding the heights for radio masts.

The masts also can take only limited amounts of traffic, meaning that a number of towers used by high-speed trading firms are heavily oversubscribed. Erecting tall masts is among several ways companies are looking to establish communications networks to improve data transmission. These include the use of high-altitude balloons, which are being explored by companies including Google parent **Alphabet Inc.**

The Richborough Mast is in the preplanning stage. It is currently undergoing an environmental impact study and will require approval from both local and national governmental authorities.

A spokeswoman for DRW and Vigilant said the company has been "working closely with local and national government agencies and meeting with the public in the surrounding communities on the proposal." It also said it was joining "with local organizations to provide public benefits from the mast, including community radio, wireless broadband access and education."



Artist's rendering of the proposed 1,050-foot Richborough Mast

VIGILANT GLOBAL UK/DRW

Chicago speed traders' 'stupid' plan for fast network halted in U.K.

January 27, 2017

(Bloomberg)—Local officials in rural England rejected as "incredibly stupid" a proposal by a group of high-speed traders to build radio masts as tall as the Eiffel Tower, dashing plans to open the fastest possible trading route between financial markets in London and Frankfurt.

At a public meeting last night, Dover District Council rejected separate planning applications from Vigilant Global, part of Chicago-based DRW Holdings LLC, and New Line Networks—a joint venture between Chicago-based Jump Trading LLC and New York-based KCG Holdings Inc.

DRW and Jump are two of the biggest trading firms based in Chicago, and KCG has roots in the city as the former Getco.

DRW and Jump have hundreds of employees that contribute to a hub of Chicago trading commerce that grew out of the futures and options trading pits operated by CME Group and CBOE Holdings. The firms, which trade mainly for the benefit of their owners and not outside customers or investors, tend to be secretive.

Over the past decade, they've been locked in a technological arms race, chasing ever-faster automated trading speeds in an effort to gain an edge over rivals. Nonetheless, recently some of them have started collaborating on communication networks that are the backbone of their trading systems.

Still, England's rural population was unmoved.

"In 26 years as a councilor, this is the worst application I have ever seen," said Bernard Butcher, the vice chairman of the planning committee in his response to Vigilant's application. "This particular proposal is just unsightly, it's too incredibly stupid for us to even contemplate."

"There have to be other locations where it will not cause so much havoc and unsightliness," he told the meeting.

On one side of the council chamber were suited executives from the world of high-speed trading and their planning and public relations advisers. On the other: members of the public opposed to the erection of two 300-meter-plus (980 feet) masts in the nearby countryside.

Vigilant and New Line Networks had waited a year for the council to decide whether they could proceed with their plans, which would have shortened trading times between Europe's two biggest financial centers.

Planning officer Andrew Somerville laid out the case against the masts: they would spoil views from Richborough Roman Fort, one of the area's main tourist attractions; they presented marginal benefit to the national economy; and Vigilant, at least, had failed to sufficiently assess the potential danger to the local environment.

"We are disappointed by the committee's decision, but acknowledge the feedback provided by the members of the committee," said Eric Bellerive, director of Global Network Architecture at Vigilant. "It is our firm belief that this proposal would have solved a real problem for the financial industry, whilst providing significant value to national and local economies. It is important that we now take time to reflect on the feedback provided by the councilors and evaluate if there is a manner in which a future scheme could progress in a mutually beneficial fashion."

A representative from New Line Networks declined to comment.

After the local official had recommended that the masts be blocked, the 10-member committee of elected councilors took turns criticizing the plans, leaving little doubt as to the eventual verdict. Vigilant's proposed tower was rejected by nine votes with one abstention. New Line Networks' tower was unanimously blocked.

The councilors dismissed arguments made by the speed traders' experts. Jon Bradburn of Montagu Evans, Vigilant's planning consultant, and Sean McNamara, the operations director of New Line Networks, were both given three minutes to make their case.

Bradburn pointed out that there is already an industrial works next to Richborough Fort, and that Vigilant has offered to share its mast with other high-frequency traders, eliminating the need for multiple towers. The councilors also heard claims made by a speaker against the Vigilant development.

"The sole use of this mast is to facilitate computerized gambling on stocks and shares," said Mike Matthews, a retired engineer at the meeting. "There are no benefits from this development either locally or nationally."

The speed traders have one last card to play. They can appeal to the U.K.'s central government, arguing that the towers have a wider benefit to the British economy. Ultimately, a minister could overrule Dover District Council, allowing the project to go ahead, said Iain Gilbey, a partner at law firm Pinsent Masons who specializes in infrastructure planning.

"It's a bit of a wait and see," Gilbey said.

Crain's Lynne Marek contributed to this report.

Interview. Don Wilson

DRW founder braced for return to volatility

Prop-trading specialist says investors look too assured about higher European rates

GREGORY MEYER AND PHILIP STAFFORD
BOCA RATON

Don Wilson says his company is "in the business of taking risk."

DRW, named from his initials, is one of the largest proprietary trading firms. From a base in Chicago, it bets its own capital via futures contracts listed on 40 exchanges. As Wall Street banks take fewer risks, companies such as the one he founded have filled the vacuum.

There is plenty of risk in the markets DRW plies. Donald Trump has promised to roll back reforms passed after the financial crisis. Europe has scheduled a series of pivotal elections. While populists fizzled at last week's Dutch polls, a more important French election is fraying investor nerves.

But measures of implied volatility for equities, bonds and currencies have eased after peaking in the wake of November's US election.

Mr Wilson, DRW chief executive, says he has been surprised by the lack of volatility since Mr Trump's election.

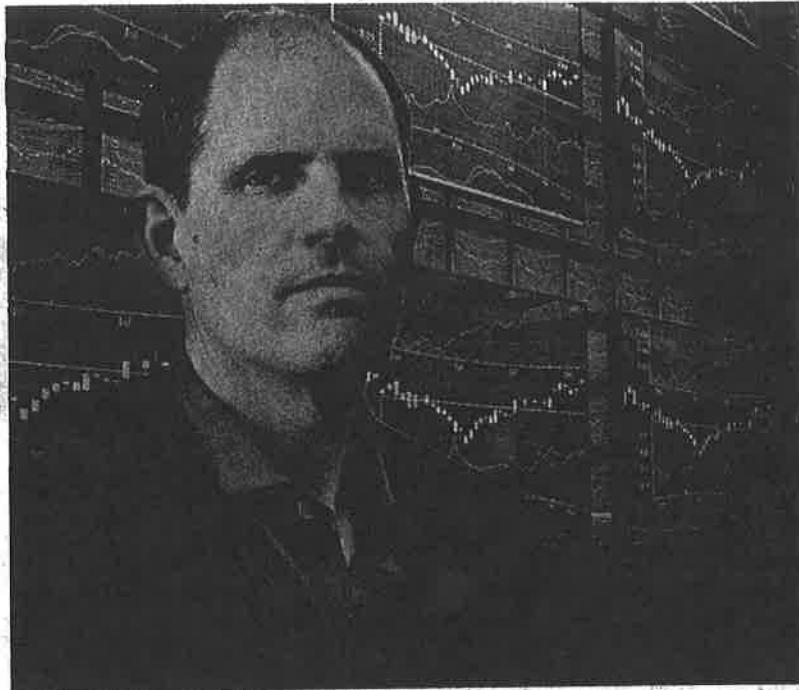
"There are many things that could happen that could cause volatility to increase," he said at a futures industry conference in Boca Raton, Florida, last week.

"In this environment, being long some wings is probably a good idea," he added, referring to options that pay out if markets become highly stressed.

In Europe, he believes markets may be too confident of higher interest rates. He points to uncertainty over the elections and the size of foreign deposits flowing into Switzerland, where rates are negative.

"There's a lot of risk of something misfiring and people becoming more concerned. Yet the markets aren't really saying that."

DRW faces turbulence of its own. Mr Wilson is awaiting a judge's ruling after



Don Wilson cites uncertainty over elections in Europe and the size of deposits flowing into Switzerland as having implications for interest rates
FT Montage/
Christopher Ditts/Bloomberg

the US Commodity Futures Trading Commission accused him and his company of "brazen and repeated acts to manipulate" an interest-rate futures market six years ago. Rather than settle with the regulator, Mr Wilson chose to fight the civil charges at trial.

The trading industry is nervously following the case, both for its importance in defining what constitutes manipulation and its potential to hobble DRW. The CFTC seeks a permanent trading ban for Mr Wilson and DRW if they are found liable.

Few trading firms are as influential as DRW, established in 1992 by Mr Wilson, then an options trader on the floor of the Chicago Mercantile Exchange. The group has 750 employees, two-thirds more than five years ago. By con-

trast, Virtu Financial, a New York peer, has fewer than 150, according to an annual report.

Mr Wilson, 49, "is absolutely viewed as a leader in the industry", said Matt Haraburda, president of XR Trading.

DRW is known for high-frequency trading in fractions of a second. A subsidiary submitted plans to build a radio tower on the English Channel to beam data between London and Frankfurt. But a UK council rejected the proposal for a structure the height of the Shard.

"As traders invest to shrink data delays from milliseconds to microseconds, the incremental improvements are constantly smaller", Mr Wilson said.

Some companies have quit, leaving bigger ones such as DRW, Jump Trading and Virtu.

"To be the fastest in a pure speed game does require greater resources," he said.

DRW says only a quarter of its business derives from speed trading. It holds some positions open for months, as evidenced by those at issue in the CFTC litigation. Of years: Convexity Properties, a DRW division, develops real estate.

Mr Wilson supports pushing privately negotiated trades, such as interest-rate swaps, on to futures markets where costs are generally lower. Unlike a typical proprietary trader, he is also an inventor: DRW has licensed its patent on variance swap futures, which track volatility, to Germany's Eurex exchange, and has created an interest rate contract to be listed by US-based Intercontinental Exchange.

The rise of electronic trading firms has accelerated exchange volumes and offered a sense that markets are liquid, or easy to enter and exit. But increasingly frequent flash crashes sug-

'There's a lot of risk of something misfiring and people becoming more concerned'

gest that those traders flee when they are needed most.

Mr Wilson blames shaky liquidity in fixed income markets on the retreat of banks, which once held more bonds in inventory. "If you push risk capital out of the market, you have to expect greater risk of flash crashes."

He declined to elaborate on the CFTC case, but on a panel in Florida he bemoaned what he called "gotcha regulation" and said government lawyers were "more interested in collecting fines and generating headlines than in making markets better".

A loss for the CFTC could shatter its theory of market manipulation, while defeat for Mr Wilson could imperil his company. For both sides, it is risky business.

IPO filing provides rare insight into HFT world

Virtu's planned listing shows bigger is much, much better in the world of rapid-fire trading

PHILIP STAFFORD

At a publicity event in London last week author Michael Lewis professed "no great antipathy to the high-frequency traders exploiting the problem" of the US equity market.

This week Virtu Financial, one of the world's largest high-speed proprietary traders, is due to list, aiming to show exactly how it navigates a world where some 13 exchanges compete for business with alternative trading venues and bank-owned platforms.

"The typical Wall Street approach is to exploit a problem," says Mr Lewis, whose book *Flash Boys*, released a year ago, put high-frequency traders at the centre of a system he said was "rigged".

"If you saw a hole in an oil pipe, most people would seek to fix it. Wall Street would look to build a village around it."

Pressure from the book has helped accelerate some investigations by the Securities and Exchange Commission into bad behaviour. But a survey of 245 market participants last month by Convergex, a US agency broker, found there was still widespread concern about high-speed traders.

Some 57 per cent thought markets were "unfair", while the number of those who had changed the way they interacted with markets had doubled in the past year to 42 per cent.

As Virtu plans to list finally, having pulled back amid the furore last April, some say its 180-page initial public offering filing offers a more accurate insight into the modern trading industry. The bottom line appears to be bigger is better in the cut-throat world of rapid-fire trading.

Virtu describes itself as one of the world's largest market makers, earning a profit on differences on the spread between bid and ask price of more than 11,000 instruments and hedging their risk by taking positions in correlated securities and indices.

"It [the market] has become a video game, and it needs what these companies bring. They supply liquidity into the market," says Larry Weiss, head of US trading at Instinet, an agency broker. Even so, he notes, "it has really started to be dominated by handfuls of big players because of the cost of technology".

For the sceptics, technology that can deliver only one overall losing trading

Fast practice: the Securities and Exchange Commission has been probing alleged bad behaviour by some HFT groups – *Alebury*

day out of the past 1,485 for Virtu seems remarkable. Others say it reflects Virtu's knowledge of trading, positioning and cutting-edge technology, which allows it to execute 5.3m trades a day globally across equities, currencies, commodities and fixed income. The wide availability of cheap, high-speed technology means only 49 per cent of those trades were profitable, with the rest unprofitable or neutral.

Using data from last year's failed flotation, Greg Laughlin, an academic at the University of California Santa Cruz, has argued that Virtu's success is down to large numbers. If Virtu had a 51 per cent win rate on its trades, Mr Laughlin calculated that one trade a day gave it a 52 per cent chance of a profitable week. Executing 10,000 a day gave it a 99.999 per cent chance.

Estimating that it in fact executed 2.5m-3.5m trades a day in the US equities market, Mr Laughlin concluded: "Given these statistics, we can readily show that the chances of Virtu's operations experiencing a money-losing day are vanishingly small."

A Credit Suisse research note two weeks ago underlined the point. Its analysts were given a teach-in by Manoj Narang, co-founder of Tradeworx, a medium-sized US high-frequency trader. He estimated that he had a slightly higher win rate of 53 per cent, but he was not as successful in the longer term.

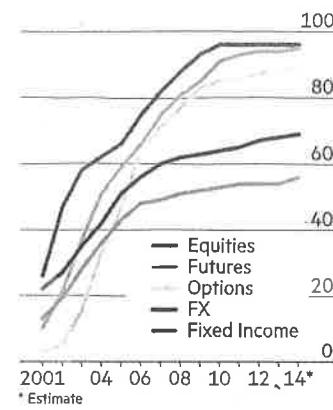
Larger firms earned in a day what it would take Tradeworx to earn in a week, the note concluded. "The only difference between [it] and larger HFT firms is that Tradeworx is four to five times smaller – therefore it has an 86 per cent daily winning percentage compared to larger firms at 99 per cent."

That, plus low market volatility, explains why many small and mid-market companies, such as Infinium, Eladium Partners and Chopper Trading, have pulled out of the market.

While the economics benefit bigger

Adoption of electronic trading

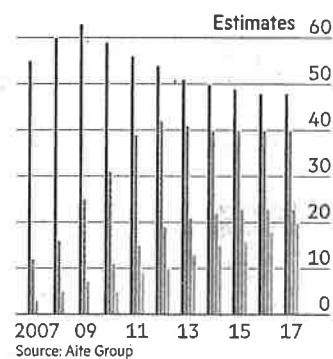
Per cent



Estimated adoption of High Frequency Trading

By region (%)

■ US ■ Europe ■ Asia ■ LatAm



Source: Aite Group

companies, their role at the centre of daily trading makes them a target for regulators. One concern is the effect of European capital rules, which will apply to more proprietary trading firms from 2017. This will force them to set aside far more capital on their balance sheets, particularly if they trade fixed income or interest rate derivatives.

"Combine that with internal organisation requirements and we see a crunch in smaller firms," says Johannah Ladd, secretary-general of the European Principal Traders Association. "The biggest firms will have a head start."

There may be other challenges. Several new venues have emerged, such as IEX and Canada's Aequitas, looking to shield investors from the worst effects of HFT. Yet as IEX, the hero of *Flash Boys*, notes, companies such as Virtu account for a fifth of trading on its exchange.

Mr Weiss says: "It's still a young business and to project five to 10 years out is virtually impossible."

Trump picks billionaire Viola as army secretary

FT Dec 20, 2016

NICOLE BULLOCK, GREGORY MEYER AND
ADAM SAMSON — NEW YORK

President-elect Donald Trump has added another billionaire to his administration, nominating high-frequency trader Vincent Viola as the secretary of the army.

A well-known figure in the trading world, Mr Viola is founder and chairman of Virtu Financial, the New York-based high speed market maker with a market capitalisation of more than \$2bn.

Mr Trump said: "Whether it is his distinguished military service or highly impressive track record in the world of business, Vinnie has proved throughout his life that he knows how to be a leader and deliver major results in the face of any challenge."

Mr Viola graduated from West Point military academy in 1977 and served in the US Army's 101st "Screaming Eagles" Airborne Division. He has remained a member of the Army Reserve since completing active duty.

"A primary focus of my leadership will be ensuring that America's soldiers have the ways and means to fight and win across the full spectrum of conflict," he said yesterday.

Brooklyn-born Mr Viola got his start on Wall Street trading oil on the sharp-elbowed floor of the New York Mercantile Exchange where he ultimately became chairman in 2001. He led Nymex as seat owners resisted the rise of electronic trading in an attempt to maintain lucrative control of volumes.

A former Nymex associate said: "Vinnie was always super-ambitious."

He is the second Trump nominee to have begun his career as a commodities floor trader. Gary Cohn, the Goldman Sachs president appointed head of the National Economic Council last week, once traded metal in the pits of New York's Comex exchange and the two are close friends.

Along with other high-frequency traders, Mr Viola found opportunity in the combination of computing power and financial dealing and founded Virtu in 2008. The company went public in 2015. Its share price has languished to about \$16 versus a listing at \$19 partly due to lacklustre volatility. Companies like Virtu perform best in times when markets are volatile with heavy volume.

Virtu confirmed that Mr Viola would step down as chairman.

After a decade in which high-frequency trading has transformed the US stock market, Wall Street's "flash boys" are now discovering the flipside of disruption.

A combination of subdued volatility across financial markets and rising costs have thinned the ranks of hyper-fast computerised trading firms, persuading New York-based Virtu Financial to pay \$1.4bn last week for rival KCG Holdings.

The acquisition will take Virtu's market share of US equity trading to about 20 per cent, putting it on a par with Chicago-based Citadel Securities, and outstripping that of smaller competitors such as Hudson River Trading and GTS. Citadel Securities is a separate, market-making arm of the Citadel hedge fund.

Larry Tabb, founder of the Tabb Group capital markets research company, makes the point that KCG has some business in which neither Virtu nor Citadel are leaders, such as trading equities for large institutions. "Citadel has a strong retail presence, while Virtu mostly makes markets for exchanges and dark pools," he notes.

The emergence of two clear heavyweights means the next chapter for HFT will bear the imprint of their billionaire founders: Citadel's Ken Griffin and Virtu's Vinnie Viola.

"They [KCG and Virtu] come from different places with respect to headcount and culture," says Justin Schack, managing director at Rosenblatt Securities.

"Virtu is part of a group of firms that were founded more recently and were automated from the start."

KCG was a merger of Getco, an electronic market maker, and Knight Capital, an older broker that grew with sales traders who relied as much on phones as new technology.

While both Citadel and Virtu are renowned for their aggressive focus on cost and speed, the two groups will have to navigate a landscape in which retaining an edge is becoming harder.

Once the market disrupters, HFTs are now the focus of competition, according to Ana Avramovic, an analyst at Credit Suisse.

"The brokers who serve [high-frequency traders] and have to interact with them on nearly every trade have also learned from them," she says. "Brokers are now introducing dynamic algorithms that apply HFT-style strategies in order to reduce costs."

Analysts and rivals say Virtu's purchase of KCG is in part a defensive reaction to changes in a market it helped refashion by generating an explosion in the volume of daily share trading to around 7bn shares a day, according to Credit Suisse.

"Obviously there is a lot less volatility in the markets and the costs of doing business have skyrocketed," Doug Cifu, chief executive of Virtu, said.

High-speed traders fight to keep edge

There are, of course, areas in which the two businesses will not compete directly. "I can understand people thinking it is a defensive deal but I think there are some offensive attributes as well," says Chris Allen, director of equity research at Buckingham Research Group.

A key challenge for Virtu will be how it manages the integration of KCG, which is the second-largest wholesale franchise, executing trades for the US's best-known retail brokers such as TD Ameritrade. By contrast, Virtu has made its name by trading on its own account.

'There is a lot less volatility in the markets and the costs of doing business have skyrocketed'

There is a risk that Virtu's preoccupation with the integration could help Citadel Securities, especially in the wholesale market say some analysts.

Citadel's share of the wholesale market is around 34 per cent compared with KCG's 25 per cent, according to Tabb Group.

Virtu has yet to lay out in detail its plans for the wholesale business — which is one KCG's crown jewels.

Virtu's total workforce of 150 people is less than a sixth of the size of KCG's, and Virtu has promised its shareholders that the deal will generate pre-tax

savings of \$208m within two years of it being completed.

"We'll have to see how embracing they really are of the client-facing business," says Larry Weiss, head of US trading at Instinet, the agency broker. He expects more of that business to become automated.

Not only will Virtu be competing with Citadel but also other HFTs and large brokers that transact for institutional investors, such as Goldman Sachs, Morgan Stanley and UBS.

Furthermore, Virtu is also accustomed to making money virtually every day, by making millions of trades and limiting its losses. By contrast KCG has made pre-tax losses in two quarters out of the last three.

In the battle for profits and scale, every edge counts. Mr Cifu acknowledges the deal will give it access to the US's vast off-exchange market. It rarely saw around a third of the market, he says, leaving Virtu to fight for scraps.

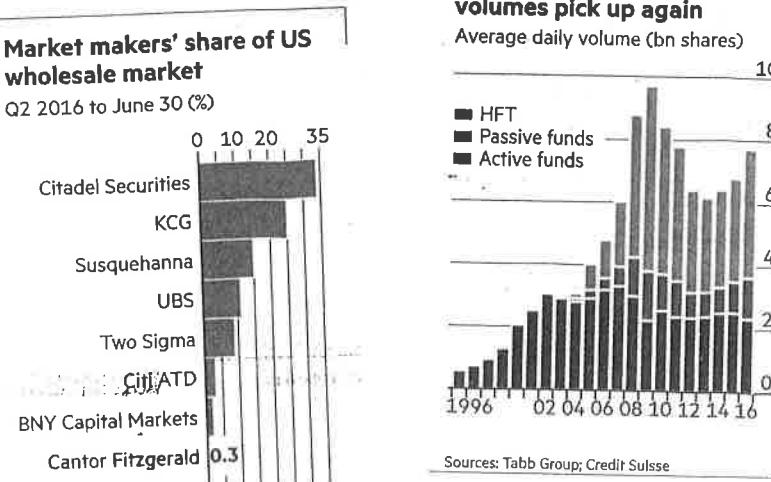
That means getting a foothold in the wholesale market is just as vital in trading as being a proprietary trader or owning a specialist, designated market-making position on the floor of the New York Stock Exchange.

To that end Citadel bought the NYSE market-making business from KCG a year ago, matching Virtu, which had bought its place in 2011.

"The more you trade, the more you supply, the more you see the book, the more you can set up your own book," says Mr Weiss.

High-frequency trading volumes pick up again

Average daily volume (bn shares)



Sources: Tabb Group; Credit Suisse

PHILIP STAFFORD — LONDON
NICOLE BULLOCK — NEW YORK

Wednesday 26 April 2017

FINANCIAL TIMES

Teza to quit HFT for hedge funds

● Tight times for high-speed traders prompt new tack ● Revenues plunge over four years

GREGORY MEYER, MARY CHILDS
AND NICOLE BULLOCK — NEW YORK

One of the biggest and fastest traders in financial markets is abandoning its core business after its revenue engine stalled, a sign of the challenge of adapting in markets that unfurl in nanoseconds.

Teza Technologies of Chicago plans to shut its proprietary trading business in the next six months to focus on building up a quantitative hedge fund that manages more than \$1bn, company executives said.

The new tack comes after net revenues at the proprietary business, which bets Teza's own money in markets from futures to bonds, steadily declined from

about \$250m four years ago to \$80m in 2015, according to three people familiar with the figures. In 2016, the business has struggled to make a profit; the people added.

"Generally, it is harder to make money," Misha Malyshev, Teza chief executive, said in a rare interview.

Mr Malyshev founded Teza in 2009, naming it after a river in his native Russia. The high-frequency trading group used automated programs to vault to the top ranks of participants on venues such as the Chicago Mercantile Exchange and BrokerTec, a marketplace for US Treasury bonds once dominated by banks.

Mr Malyshev has a doctorate in astro-

physics from Princeton. In 2008, he made more than \$1bn for the hedge fund Citadel while serving as its head of high-frequency trading.

Teza's situation reflects broader pressures within the industry, where increasing sums are spent on telecoms infrastructure, computer algorithms and exchange fees in order to be an instant faster than others. Chopper Trading, another HFT group, quit the arms race last year when it sold out to competitor DRW.

Teza expanded from about 45 staff in 2013 to 117 about a year ago. It has since dropped to 93, Mr Malyshev said.

Teza began approaching investors in July with potential deals, including pur-

'Generally,
it is harder
to make
money'

Misha Malyshev,
Teza chief
executive

chasing equity in the core proprietary business, licensing its technology and becoming a partner in the fund business, people familiar with the matter said.

Virtu Financial, a trading group based in New York, acquired wireless capacity and hardware from Teza in Europe and the US, people familiar with the matter said. Virtu declined to comment. Asked if Teza was trying to raise cash, Mr Malyshev said: "Capital is never bad."

Teza Capital Management, the hedge fund, started managing outside money in October 2014 and contained \$1.1bn as of February, according to a regulatory filing.

"The future of Teza is the asset management business," said Mr Malyshev.

High-Frequency Hyperbole

By Clifford S. Asness
And Michael Mendelson

A few nights ago, CBS's "60 Minutes" provided a forum for author Michael Lewis to announce that Wall Street is "rigged" and for the sponsors of a new trading venue called IEX to promise to unrig it. The focus of the TV segment was high-frequency trading, or HFT, an innovation now over 20 years old.

The stock market isn't rigged and IEX hasn't yet generated a lot of interest. In our profession, what we saw on "60 Minutes" is called "talking your book"—in Mr. Lewis's case, literally.

The onslaught against high-frequency trading seems to have started about five years ago when a blogger made a wildly exaggerated claim about one firm's HFT profits. Nowadays after any notable market event, and again last Sunday for no reason other than a book launch, the world gets bombarded with arcane details and hyperbolic assertions about HFT strategies. If you find the discussion overwhelming, we have some good news: The debate can be understood without knowing how equity orders are routed, matched or canceled.

Few professionals completely understand the details of market microstructure. Rather, when someone has a strong opinion about the subject, it's likely to be what they want you to believe; not what they know.

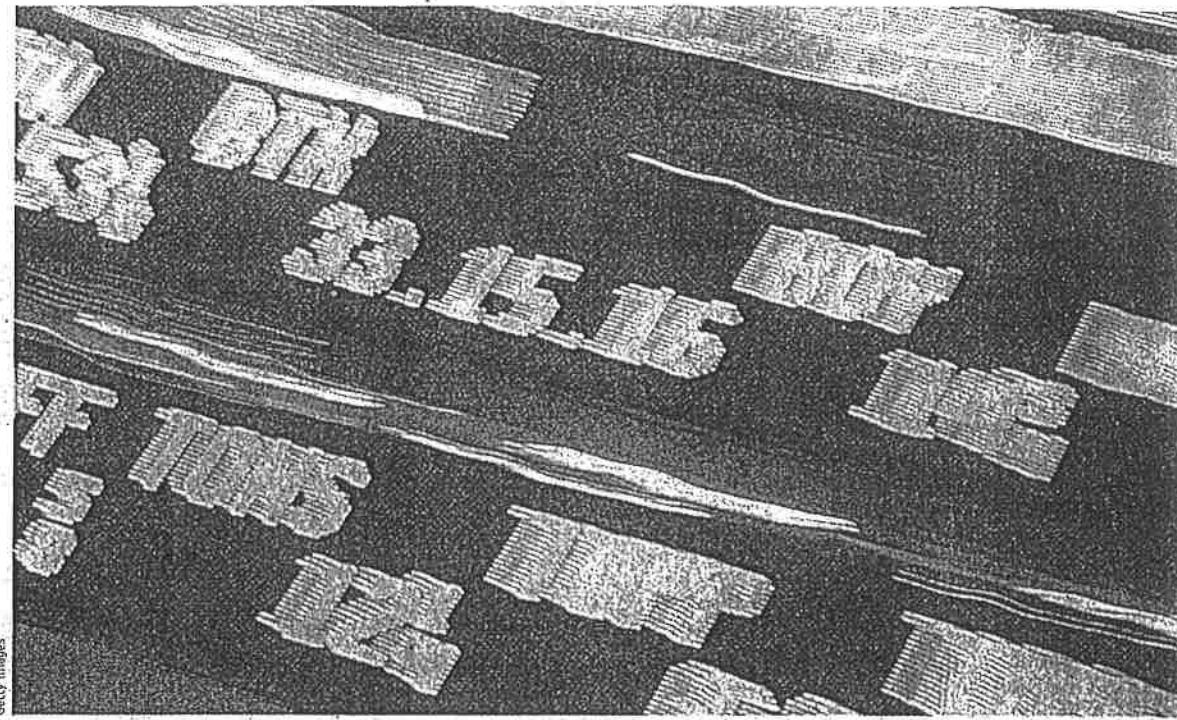
Our firm, AQR Capital Management, is an institutional investor, primarily

Beware of critics who are 'talking their book' about trading that lowers costs.

managing long-term investment strategies. We do not engage in high-frequency trading strategies. Here is where our interest lies: What is good for us is lower trading costs because it translates into better investment performance and happier clients, which makes our business slightly more valuable.

How do we feel about high-frequency trading? We think it helps us. It seems to have reduced our costs and may enable us to manage more investment dollars. We can't be 100% sure. Maybe something other than HFT is responsible for the reduction in costs we've seen since HFT has risen to prominence, like maybe even our own efforts to improve. But we devote a lot of effort to understanding our trading costs, and our opinion, derived through quantitative and qualitative analysis, is that on the whole high-frequency traders have lowered costs.

Much of what HFTs do is "make markets"—that is, be willing to buy or sell stock anytime for the cost of a



fraction of the bid-offer spread. They make money selling at the offer and buying at the bid more often than they have to do it the other way around. That is, they do it the same way that market makers have done it since they were making markets in Pompeii before Mount Vesuvius halted trading one day. High-frequency traders tend to do it best because their computers are much cheaper than expensive Wall Street traders, and competition forces them to pass most of the savings on to us investors. That also explains why many old-school Wall Street traders hate them.

One of the biggest headline-grabbing worries about HFTs is how fast the trades are conducted. The speed sounds unnecessary, dangerous and possibly nefarious—"These guys care about the speed of light!" For the most part, though, HFTs don't need that super speed to get ahead of the little guy or even institutional traders, but to get ahead of other HFTs. Some of the loudest complaints about high-frequency trading come from the slower traders who used to win the races.

While we like HFTs on balance for reducing our clients' trading costs, some may push the envelope at times. Some of them may negotiate advantages that might be bad for markets. Worse, these arrangements tend to be little understood by the broader range of market participants. A little more transparency would be good here, and the market venues that have been offering these deals have been moving in that direction. They should move faster.

But these concerns are occupying too much attention. The biggest concern we have with modern markets is their complexity and the associated operational risks. The market structure

that enables the HFTs and provides us with their benefits may also be one that risks technological calamity.

The good news has been that regulators began to focus on this potential problem last year. Unfortunately, the recent fusillade of hyperbole about HFT practices threatens to derail this effort and refocus attention where the problem isn't. Real work is necessary to improve and safeguard a complex and still reasonably new system. We shouldn't get ourselves dragged into a hyped-up war over a matter that doesn't affect investors very much—and where, to the degree that it does, we'd argue that the effect is easily a net positive.

So why are so many people so loudly certain about the problems of high-frequency trading? Again, look to interests. Making mountains out of molehills sells more books than a study of molehills. But some traditional asset managers are also HFT critics. These managers are institutional investors like us but with different investment strategies and trading methods.

Rather than embracing electronic markets, these managers have stuck with their old methods. They think HFT costs them money. Often when they try to trade large orders quickly, they find the trades more difficult to execute in a market that has gravitated toward more frequent trades in smaller sizes, and that the price moves away from them faster now.

We doubt that these old-school managers were truly better off in the pre-HFT world, but it's hard to prove either way. And if they're right, it may be only because HFTs have made the markets more efficient, eliminating some of the managers' edge.

Well, sorry, but prices responding quickly—and traders not being able

to buy or sell a ton without the market moving—is what is supposed to happen in a well-functioning market. It happens to us too. It may be that in the old days these managers were able to take advantage of whomever was on the other side of their trade, and that nowadays they find it far more difficult to gain that advantage. A more efficient market shouldn't be mistaken for an unfair one.

These big, traditional investment managers represent a business opportunity to anyone who can offer them new market venues, like IEX, that might conceivably avoid the perceived ill effects of high-frequency trading. We wish them well in that effort, and if they succeed these new exchanges and their clients will benefit. But let's allow the issue to be decided by open competition, not by politics, demagoguery and rules born of crony capitalism.

Our bet is that high-frequency trading comes out on top as it offers more investors better execution. But we have zero problem being proven wrong by the marketplace.

How HFT has changed the allocation of the "pie" between various market professionals is hard to say. But there has been one unambiguous winner, the retail investors who trade for themselves. Their small orders are a perfect match for today's narrow bid-offer spread, small average-trade-size market. For the first time in history, Main Street might have it rigged against Wall Street.

Mr. Asness is managing and founding principal of AQR Capital Management, where Mr. Mendelson is a principal and portfolio manager. Aaron Brown, chief risk officer at the firm, also contributed to this op-ed.

Vanguard leads the way in dismissing high-frequency trade rigging claims

By Stephen Foley in New York

The chief executive of Vanguard, which became the world's largest mutual fund company by championing low costs for the small investor, has ridden to the defence of high-frequency trading firms and dismissed suggestions that the stock market is rigged.

Bill McNabb's contribution to the increasingly shrill debate follows the publication last month of Michael Lewis's book *Flash Boys*, which claims that HFT companies manipulate the stock market. It also comes as government authorities step up their investigations into potential abuses of equity markets.

In a Financial Times interview, Mr McNabb said HFT firms had helped investors cut their trading costs, and urged the US Securities and Exchange Commission not to reverse the market reforms that gave birth

to the phenomenon. HFT firms knit together the dozens of trading venues that compete for investors' business, he said. "Our perspective is be careful in pulling the thread because the whole suit may fall apart."

Vanguard manages \$2.5tn of client assets, mainly in mutual funds, and has quadrupled in size over the past decade by preaching the gospel of low fees.

The firm has had to spend heavily on technology to deal with the explosion in the number of stock exchanges and trading venues, but says the

'Our perspective is be careful in pulling the thread because the whole suit may fall apart'

Bill McNabb, Vanguard

reduction in spreads – the difference between the price of buying and selling stocks – far outweighs those costs.

"Are different traders trying to gain every advantage they can? I think that's true," Mr McNabb said. "I think that's always been true – but I don't think the market is rigged.

"From a data perspective, we can see what's happened to our fund shareholders over the last 20 years and they've benefited by that reduction in transaction costs."

Mr McNabb also dismissed claims that HFT firms sniff out when a large buyer or seller is trying to trade so they can push the market against them.

Vanguard had examined these "market impact" costs, by looking at tracking error in its exchange-traded index funds. "There's no question... that the cost to investors through funds has come down."

It has expressed its view of the benefits of the current market structure several times as concern about HFT has risen in Washington. In a 2010 submission to the SEC, which helped ease the political heat on HFT at the time, it estimated transaction costs had declined by 50bp over the previous 10-15 years.

Vanguard does support limited changes to market practices so that exchanges do not pay HFT firms for orders and offer different trading fees to those who add or use up liquidity, Mr McNabb said, but it does not favour a total reform of market structure that some support.

The SEC has said it is looking at certain HFT practices as part of its review of equity markets.

The Commodity Futures Trading Commission, Department of Justice and FBI all recently confirmed investigations into HFT, along with New York attorney-general Eric Schneiderman.

IEX, unleashed

Speed bumps in the night

NEW YORK

American regulators approve a controversial new stock exchange

IT IS a ruse familiar to officials the world over: if you have embarrassing or controversial news, release it on a Friday, the later the better. The decision on June 17th, a Friday, by the Securities and Exchange Commission (SEC), Wall Street's main regulator, to approve a new stock exchange sounds mundane. But the fact that the briefing explaining the agency's reasoning was scheduled for 8pm gives a sense of the awkwardness of the topic.

IEX, the newly approved exchange, has one distinctive feature. Whereas most share-trading venues pride themselves on the speed with which trades can be executed, IEX promises to slow down transactions deliberately, with a "speed bump" of 350 millionths of a second. This idea has been controversial for two reasons. First, it is hard to reconcile with rules that oblige an exchange to execute a trade immediately, at the best available price, even if that means sending it to a rival market. Second, by attempting to slow things down, IEX is taking aim at a system it believes is rigged to favour ultra-fast high-frequency traders (HFTs) at the expense of the investors and companies that stockmarkets are supposed to nurture.

At the moment share-trading orders bounce between 13 exchanges (at which bids and offers are made public), more than 40 dark pools (where they are not) and an indeterminate number of brokers. Big asset managers suspect this sprawling, fragmented system allows HFTs to nip in ahead of them and take advantage of their orders—an idea that was given credence in a 2014 book by Michael Lewis called "Flash Boys", which cast IEX in the role of hero.

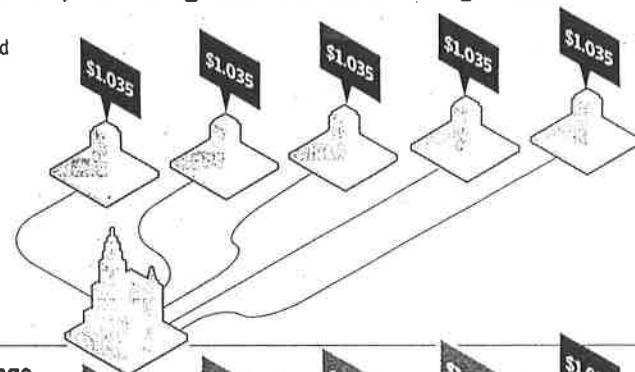
By slowing down HFTs along with everyone else, IEX's speed bump is supposed to protect less nimble investors. Its application received lots of support from big asset managers, at any rate. But the SEC was hesitant, asking IEX to modify its application five times and deferring a decision on it twice. In the end, at the same time as it approved IEX's application, the SEC issued an "updated" interpretation of its best-price rule, allowing for delays in execution of up to a thousandth of a second. Critics fear even more fragmentation; backers hope for a fairer system. The SEC has promised to study the effects of the speed bump, and revise its rules again if necessary. Keep your Friday evenings free.

Wednesday, June 15, 2016

THE WALL STREET JOURNAL

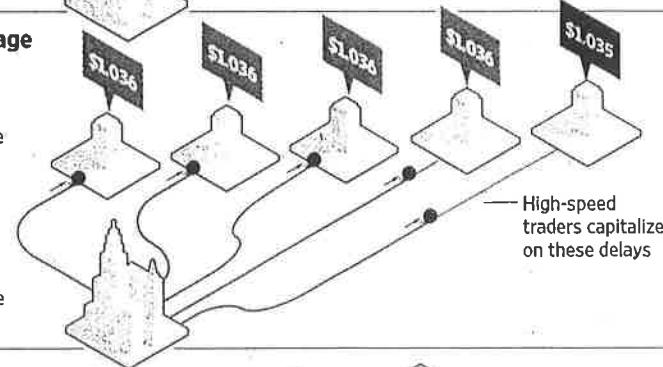
IEX Platform | Slowing the stock-trading race

The U.S. stock market is comprised of multiple exchanges in data centers that are spread out geographically. That means when changes occur, it takes time for them all to adjust.



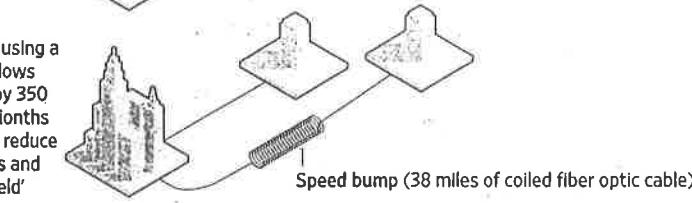
Latency arbitrage

One quirk of this system is that super-fast traders can take advantage of discrepancies where one exchange—or a competing trader—hasn't responded quickly enough to a change in the market.



Speed bump

IEX argues that by using a speed bump that slows down every order by 350 millionths of a second, it can reduce those opportunities and 'level the playing field' among investors.



WSJ Oct 21, 2016

Nasdaq

Speedup Is Threat To IEX

BY ALEXANDER OSIPOVICH

Upstart stock exchange IEX Group Inc. tried to slow down high-frequency traders by putting in a speed bump. Now, an upgrade by Nasdaq Inc. may speed them back up again.

The time it takes for trades executed at U.S. exchanges such as IEX to be published on Nasdaq's consolidated feed of stock prices will shrink drastically following an overhaul that takes effect Monday—to less than 20 microseconds, down from 480 now.

As a result, a high-speed trading firm could learn of trades done on IEX and quickly act on that knowledge at other exchanges where prices are just millionths of a second out of date, market experts say. That sort of front-running is exactly what IEX was set up to prevent.

"The fact that this shortcut is out there does negate to a certain extent IEX's whole model," said Richard Johnson, vice president for market structure and technology at Greenwich Associates.

IEX—whose founders, including Chief Executive Brad Katsuyama, gained fame as the

protagonists of Michael Lewis's book "Flash Boys"—set itself up as a place where investors could buy without disclosing their intentions to high-frequency traders who might use that information against them. It did so by setting up 350-microsecond delays on information coming in and out of IEX. The idea was that by the time a fast trader learned of a transaction executed on IEX, it would be too late to act on it.

But there is another pipe of information out of IEX. Regulations require the exchange and its peers to report trades to "securities information processors" run by the Nasdaq and New York Stock Exchange without delay. The SIPs consolidate quote and trade data for stocks listed on those two exchanges.

That source of information wasn't a problem for IEX when trades took 480 microseconds to be posted by the SIP. But it could be once Nasdaq's upgraded, faster SIP goes live Monday at 4 a.m. EDT.

IEX says Nasdaq's faster speeds have been running in test mode for more than a month and haven't affected its usefulness. Investors' orders "will continue to benefit from our outbound speed bump," said Eric Stockland, IEX's chief strategy officer. The change at Nasdaq's SIP "does nothing to change this."

IEX said it has studied the implications of the SIP upgrade and concluded that it is highly unlikely for any high-speed strategies to emerge that would exploit information going out on the public feed before emerging from the outgoing speed bump.

Ironically, the threat to IEX stems from efforts to correct a speed deficit at the SIPs that many complained had tilted the markets in favor of high-speed traders. Critics accused the exchanges of neglecting

the public-facing SIPs while setting up faster, private access for traders who can afford to pay higher fees. The different speeds at which trade data are published gave high-frequency traders an opening to exploit fleeting price differences in shares of the same company across different markets, critics say.

"Investors will benefit from lower latency in a highly valuable, inexpensive public feed," Jeff Davis, Nasdaq's deputy general counsel, said of the upgrade.

The upgrade to the data feed "is making the market a little bit more fair," said Patrick Flannery, chief executive of MayStreet LLC, a financial-markets software firm.

Speed-driven trading strategies are an unexpected consequence of the way stock trading has evolved in the U.S. Regardless of where they are listed, shares can be traded on any number of exchanges, with price and transaction data shared among all of them. Trades are supposed to be executed at whichever exchange offers the best price. That means big orders can be broken up among many exchanges. And since those exchanges aren't all in the same

place, there are time lags in how quickly updated information arrives at each.

Specialists in electronic trading say the heyday for capturing tiny profits at the expense of slower investors was six or seven years ago. Back then, banks and brokers sometimes relied on the SIPs to stay abreast of the market. Today, Wall Street has gotten savvier about the need to get market data from direct feeds and to locate their trading systems' servers as close as possible to the exchanges' data centers.

While most market participants have reacted by trying to become faster, IEX decided to slow things down. A speed bump on incoming orders gives the exchange time to scour the prices quoted on other platforms to ensure it is executing at the best price. The second, outgoing bump imposes a delay before market participants learn about the trade from IEX.

The new, faster SIP could offer a way around that second bump. "Very rarely has data been available through the SIP faster than it has these proprietary feeds," MayStreet's Mr. Flannery said. "There is definitely some possibility that it will be gamed."

Workaround

IEX slows down trading with two speed bumps. Now, with Nasdaq's SIP about to become faster, market players will learn information more quickly from the public feed than from IEX.

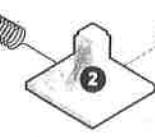
1 Order sent to IEX

Incoming trade order goes through IEX's speed bump



2 IEX executes trade

IEX reports trade to Nasdaq's securities information processor



3 Market learns of trade from SIP

Starting on Monday, trade will be public **faster on SIP**, with less than 20 microseconds processing time

4 Market learns of trade from IEX

IEX reports trade to market after a **350-microsecond speed bump**



previously took 480 microseconds

Sources: IEX; Nasdaq
THE WALL STREET JOURNAL.

Who's scary now?

The bond market is transformed: fewer vigilantes; more forced buyers

JAMES CARVILLE, political adviser to Bill Clinton, the former president, famously said that he wanted to be reincarnated as the bond market so he could "intimidate everybody". He was frustrated by the administration's inability to push through an economic stimulus for fear of spooking investors and pushing bond yields higher.

More than 20 years later, the world looks very different. Many developed countries have been running budget deficits ever since the global financial crisis of 2008; their government debt-to-GDP ratios are far higher than they were in the early 1990s. Yet the bond market looks about as intimidating as a chihuahua in a handbag; in general, yields are close to historic lows.

In the 1990s "bond-market vigilantes" sold their holdings when they feared that countries were pursuing irresponsible fiscal or monetary policies. In Britain even fear of a "hard Brexit" is only now being reflected in rising gilt yields—and they are still below the (very low) levels seen before the vote to leave the EU in June. Even developing countries with big budget deficits can borrow easily. This week, for example, Saudi Arabia tapped the markets for the first time, raising \$17.5 billion—the largest-ever emerging-market bond issue.

Vigilantes have become vastly outnumbered by bondholders with no real interest in maximising the return on their portfolios. Central banks have been the biggest factor in the market's transformation. After the crisis, they turned to quantitative easing (QE), ie, expanding their balance-sheets by creating new money in order to buy assets. The collective balance-sheets of the six most active (the Federal Reserve, Bank of Japan, European Central Bank, Swiss National Bank, Bank of England and People's Bank of China) have grown from around \$3 trillion in 2002 to more than \$18 trillion today, according to Pimco, a fund-management group. These central banks want to lower bond yields—indeed, the Bank of Japan intends to keep the ten-year Japanese bond yield at around 0%. Instead

of acting as vigilantes patrolling *profligate* politicians, central banks have become their accomplices.

Then there are pension funds and insurance companies, which buy government bonds to match their long-term liabilities. Neither group has an incentive to sell bonds if yields fall; indeed, they may need to buy more because, when interest rates are low, the present value of their discounted future liabilities rises. Banks, too, play an important role. They have been encouraged to buy government bonds as a "liquidity reserve" to avoid the kind of funding problems they had in the 2008 crisis. They also use them as the collateral for short-term borrowing.

Yielding to none

With so many forced buyers, trillions of dollars-worth of government bonds are trading on negative yields. "When you have so many price-insensitive buyers, the price-discovery role of the market doesn't work any more," says Kit Juckes, a strategist at Société Générale, a French bank.

For much of the 20th century, bonds were the assets of choice for investors wanting a decent income. No longer. Government bonds now seem to be a home for the rainy-day money of institutional investors. The rules say government bonds are safe, making it virtually compulsory to own them. "It's about the return of capital, not the return on capital," says Joachim Fels, Pimco's chief economist.

If central banks are willing buyers of an asset, that asset is as good as cash for most investors. So like cash, government bonds generate a very low return. Always true of the shortest-dated bonds, to be repaid in a few weeks or months, this now applies to a much broader range: two-year debt yields are negative in Germany and Japan and below 1% in America. Open-market operations, in which central banks buy and sell securities, used to focus on debt maturing in less than three months; now they cover bond yields at much longer maturities.

This new-style bond market has created a problem for those who run mutual funds or who manage private wealth—and who do care about the return. Large parts of the bond market no longer offer the rewards they used to. As each year begins, polls show that fund managers think bond yields are bound to rise (and prices to fall); each year they are surprised as yields stay low. "When your old-fashioned pricing model doesn't work, how do you decide when the asset is cheap?" asks Mr Juckes.

In practice, such investors have been forced to take more risk in search of a higher return. They have bought corporate bonds and emerging-market debt. And in the government-bond markets they have bought higher-yielding longer-term debt.

A key measure of risk is duration; the number of years investors would take to

earn back their money. In Europe the average duration of government debt has increased from six to seven years since 2008, according to Salman Ahmed of Lombard Odier, a fund-management group. That doesn't sound much. But the longer the duration of a portfolio, the more exposed it is to a rise in bond yields. Mr Ahmed reckons that a half-a-percentage-point rise in yields "would create significant and damaging mark-to-market losses".

Another change in the bond markets exacerbates the problem: liquidity has deteriorated. There have been some sudden jumps in yields in recent years—the "taper tantrum" in 2013, when the Fed started to reduce its QE programme; and a surge in German bond yields in 2015, for example.

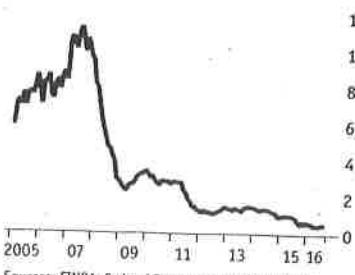
Banks may hold bonds for liquidity purposes. But because they are required to put capital aside to reflect the risk of holding corporate debt, they have become less keen to own them for market-making, or trading. Before 2008, bond dealers had inventories worth more than 2% of the corporate-bond market; now their inventories are only a tenth of the size, in relative terms (see chart on previous page).

So should a large number of bond investors decide to sell their positions in risky debt, buyers will be scarce; prices may move very quickly. Yet it is not difficult to imagine reasons for a sell-off. If the Fed decides to push up interest rates more quickly than the markets expect, bond yields could rise across the globe. The same could happen if central banks in Europe and Japan decided they no longer wanted to buy government debt: such fears this month nudged up yields in Europe. Or investors might start to fret about the amount of credit risk they have taken. In the emerging markets, for example, more than half of corporate bonds are ranked as "speculative" or "junk", and the default rate has been steadily rising.

In short, as Mr Juckes puts it, the bond market is "brittle". It is priced for a world of slow growth and low inflation, leaving no margin for error if things change. The most intimidating thing about the modern bond market now is the risk that they do. ■

Vanishing inventories

US primary dealers' corporate-bond holdings
As % of amount outstanding



Sources: FINRA; Federal Reserve Bank of New York

US asset managers roll out interval funds to fend off investor drawdowns

FT March 8, 2017

ERIC PLATT — NEW YORK

Asset managers in the US are embracing a little-known vehicle that can invest in illiquid corporate bonds without the risk of investors rushing for the exit: interval funds.

Closed-end credit interval funds that limit investor redemptions to a particular date each quarter or month have been launched by Pimco and Medley Management, with a handful from FS Investments and Griffin Capital awaiting approval from US regulators.

Their arrival comes with memories of the closure in late 2015 of Third Avenue, a bond fund specialising in distressed assets, still fresh for money managers. The move reverberated through credit

markets, underlining the risks a drawdown or run on could have on owners of lowly or unrated corporate bonds.

While interval funds have until now targeted real estate, catastrophe bonds, syndicated leveraged loans and online consumer loans, this flurry of funds is centred on public and private corporate debt, including bonds that rarely or never change hands.

Portfolio managers say the structure offers investors access to higher-yielding securities while easing the difficulties of managing a fund with daily liquidity. The lock-up enables fund managers to take a longer-term view and avoid being a forced seller if the market seizes up and other investors in the fund come calling for their money.

"Oftentimes it is investor psychology that plays such a role in wealth generation," said Jason Mandinach, a product manager with Pimco responsible in part for its new credit interval fund.

"If you can put together a structure that removes the ability to [withdraw] money when you want it most at a liquidity dislocation, this structure can help investors help themselves."

High-yield corporate bonds, considered speculative investments by the rating agencies, have a volatile record during tantrums.

Between November 2015 and the nadir of a sell-off in February 2016, US junk-rated corporate debt lost 9.7 per cent.

By the end of 2016 the asset class had

rebounded to return 17.5 per cent, according to Bank of America Merrill Lynch. Interval funds hope to take advantage of those dislocations.

The funds have been coalescing around a quarterly redemption schedule that typically allows investors to withdraw at least 5 per cent of the fund's assets.

Should redemption requests outpace a fund's quarterly liquidity, investors could find themselves locked in the fund for years. Conversely, if most holders are sitting pat, investors could redeem their money faster.

Brook Taube, chief executive of Medley, which will run an interval fund under its Sierra banner, said the funds were viewed by the industry as a way to

"solve access" to less-liquid assets with a "liquidity structure that is sensible".

"Looking at the current number of interval funds in the market, the success we're seeing those funds have, our anticipated launch and others that we see in registration with the Securities and Exchange Commission, lead us to believe this market will continue to grow," he said.

Pimco, Medley, FS, Griffin and CION Ares have each filed paperwork to sell shares worth roughly \$1bn in their funds, figures that can be increased with the SEC should demand merit it. Alongside several smaller funds and a dedicated energy fund from FS, more than \$7bn is on registration with the SEC or approved for sale.

Corporate-bond markets

Click to trade

Corporate-bond markets are being revamped by digitisation

JUST a few decades ago, an asset manager wanting to trade shares, bonds or derivatives almost always had to call up the trading desk at a big investment bank. Today shares and many derivatives can be traded with a few simple clicks (or even in fully automated fashion, using algorithms). But buying and selling bonds, especially corporate bonds, is still an old-fashioned business. Over four-fifths of trading in American corporate bonds still takes place with a dealer, usually over the phone. Yet digitisation is at last beginning to change the structure of bond markets: witness the announcement on April 11th by Tradeweb, an electronic-trading platform, that it is to offer "all-to-all" trading in European corporate bonds, ie, a system in which any market participant can trade with any other.

Electronic bond-trading is not in itself new. Tradeweb's platform, initially limited to trading of American Treasuries, was unveiled in 1998. Around half of Treasuries, and nearly 60% of European government bonds, are now traded electronically, reckons Greenwich Associates, a consultancy. But for corporate bonds, progress has been slower: only 25% of global trading volume in investment-grade bonds, and merely 13% of that in high-yield ones, is electronic. The market is huge—with over \$50trn out-

standing globally, and over \$1.5trn-worth issued last year in America alone. But corporate bonds vary in maturity, issue date and in where they stand in the issuer's hierarchy of debt. Unlike, say, most sovereign debt, it is traded only rarely; 90% of all corporate bonds change hands fewer than five times a year. The shares of a company, by contrast, usually come in at most two types (common and preferred), and are traded frequently on centralised exchanges.

The traditional way of matching buyers and sellers has been for dealers to take on the risk. They name a price, buy bonds and hold them in their inventory until a buyer emerges. This explains why personal relationships still matter so much in the bond market. The model is deeply entrenched: even most electronic platforms have adopted it, in the form of "request for quote" (RFQ) systems, where dealers have the exclusive right to quote prices. But when dealers are unwilling to hold onto bonds, as many have been since the financial crisis, because of tighter capital requirements, then such systems offer no more help than phone trading. Some bonds trade so rarely that a sell- or buy-query may elicit no responses at all.

One new source of liquidity has come from exchange-traded funds (ETFs). Shares in bond ETFs, like those composed of equi-

ties, track indices, allowing investors access to a basket of bonds. But the impact for bonds is more significant, because bonds are otherwise traded so rarely. Indeed, bond ETFs are more liquid than the assets the funds own. But ETFs still need dealers: the institutional investors that create and redeem ETF shares have so far had to rely either on voice-trading or RFQ systems.

All-to-all trading, by contrast, has the potential to change bond-market dynamics more fundamentally. Pioneered in 2012 by MarketAxess, the second-largest bond-trading platform after Bloomberg, it allows any user of a network to trade with another directly, whether asset manager or dealer. Asset managers, who provide 39% of the liquidity in MarketAxess's all-to-all system, are thus in direct competition with dealers (who provide 29%). As Richard Schiffman of MarketAxess puts it, all-to-all makes it possible for asset managers to move from being price-takers (having to accept dealer quotes) towards being price-makers (setting their own prices).

We're all dealers now

Momentum is gathering as all-to-all catches on with other platforms, too. Smaller ones, such as Liquidnet and Trumid, already offer it. But Tradeweb's announcement this month carries particular weight because it is a sizeable force—the third-largest in the market, thus leaving only Bloomberg, the market leader, with no all-to-all offering as yet. At MarketAxess, the new system already represents 16% of trading volume in American investment-grade corporate bonds, and fully 34% of that in American high-yield bonds.

Some argue that even all-to-all systems, let alone RFQ, do not tackle one big difficul- ►►

ty: that buyers and sellers are not always present at the same time. Algomi, a bond-market data firm, seeks to match buyers and sellers across time. Its interface for dealers allows traders easily to keep track of inquiries into a particular bond; it also suggests similar bonds if that one is not available. For investors, the company provides data on trading activity in particular bonds. And for trades where a dealer cannot match buyers and sellers, it has, in partnership with Euronext, an exchange provider, set up a trading venue for corporate bonds that will link up dealers in its network. So dealers should be able to gradu-

ate from risk-taking to matchmaking.

Another factor that will change the structure of the bond market is regulation. From January 2018 MiFID 2, a wide-ranging European financial-market regulation, will require market participants to report the prices and approximate volumes of all completed bond transactions—an unprecedented level of detail (earlier American rules required more limited price disclosure). Such transparency is expected to weaken dealers' market power. The sheer complexity of this undertaking will also push more trading onto electronic platforms, which are busy embedding auto-

matic reporting.

Amid all this change are tantalising hints of another potentially transformative trend: full automation. Tradeweb has already introduced a number of protocols that allow the preprogramming of a series of trades: eg, selling one bond and buying another with the proceeds; or arranging currency hedging. MarketAxess has even seen expressions of interest from hedge funds wishing to trade bonds using algorithms. Such moves have brought a lot more liquidity (and volatility) to other markets. In the sleepier world of corporate bonds, the impact could be far-reaching. ■

Fidelity Ramps Up Broker Price War

BY SARAH KROUSE

Fidelity Investments is slashing what clients pay to trade certain holdings online by 38%, joining a race to the bottom as brokerage firms tussle for increasingly cost-focused customers.

Fidelity will lower online trade commissions on U.S. stocks and exchange-traded funds to \$4.95 from \$7.95, making its pricing the lowest among large retail brokerages. The move undercuts rivals including **Charles Schwab Corp.**, which recently made a reduction of its own to \$6.95 from \$8.95.

TD Ameritrade and **E*Trade**, two other giants that stoked a prior price war as online brokerages boomed in the late 1990s, charge \$9.99 per online stock trade.

Dueling price cuts are a way for brokerages to capture growing sums of money flowing into ETFs, lower-cost products that track the performance of a basket of securities but trade on exchanges like stocks. Assets in U.S. ETFs surged to \$2.5 trillion at the end of last year from \$938 billion five years earlier, according to consulting firm **ETFGI LLP**. Schwab, Fidelity and other large brokerage firms also offer commission-free trading for a number of ETFs.

Asset-management firms that provide the funds brokerages sell have been equally aggressive about pulling down fees. In some cases, that means the cost of investing is tumbling toward zero. By the end of 2015, the most recent year for which data are available, 348 mutual funds and ETFs tracked by Morningstar Inc. charged investors 0.1% or less, up from 125 such funds five years earlier.

Fidelity has a large money-management business as well as a brokerage business.

There have been earlier attempts to bring down trading commissions across the industry. In 2010, Schwab cut the cost of trading stocks and some ETFs to \$8.95 from \$12.95 for many customers, and E*Trade scrapped a \$12.99 per stock commission tier in favor of a baseline \$9.99. Fidelity in 2010 got rid of tiered pricing for U.S. equity trades, charging all customers \$7.95 instead of \$8, \$10.95 and \$19.95.

When Schwab reduced its standard online commissions again earlier this month, some industry analysts speculated that it could trigger another round of cuts.

Fidelity's online price cuts weren't in response to any one competitor, said Ram Subramanian, president of Fidelity's retail brokerage business, but was a "big and dramatic" change and a "long-term move for us."

The firm, with 17.9 million customer accounts, has tried in recent years to woo millennials through improved mobile applications and debt-management services, and the cuts are partly a way to attract more younger investors. Fidelity has also tried to more aggressively attract fresh cash from investors through fund fee cuts and other incentives.

U.S. Aims to Rev Up Trading in Small Caps

Shares in some small companies will start trading in five-cent rather than one-cent increments Monday, in the first adjustment to "tick" sizes since the decimalization of the U.S. stock market 15 years ago.

The move to nickel-increment price quotes is part of an experiment into whether widening tick sizes can boost trading in small-capitalization stocks, even as doing so could mean higher trading costs for investors.

The effort, known as the Tick Size Pilot Program, is set to start Monday with 10 stocks

and by the end of October is expected to involve about 1,200 companies. The Securities and Exchange Commission began pursuing the program in 2014 after lawmakers questioned whether larger trading increments for small stocks could boost interest in small-company shares and, in turn, initial public offerings and economic growth.

The program marks the first time tick sizes have been widened since decimalization in 2001, in which the SEC forced exchanges to start trading stocks at penny increments, instead of fractions of a dollar,

By ALEXANDER OSIPOVICH

typically one-eighth or one-16th.

Decimalization was widely viewed as good for investors because it slashed profits for market makers, the intermediaries that commit to buying or selling stocks throughout the trading day. Market makers tend to profit from wide bid-offer spreads, which are the difference between prices to buy and sell a stock. With decimalization, such spreads became smaller.

Since then, some have said the shift harmed small-capitalization companies, arguing it reduced the incentives for market makers to trade their stocks.

With large companies, which have high volumes of trading activity, market makers can profit despite tight spreads because the shares trade so often. But small caps are often thinly traded.

The tick-size experiment was partly prompted by lobbying from some investment banks and former stock-exchange officials who wanted more financial incentives for trading small stocks.

Supporters of the pilot program say forcing small-cap stocks to trade at five-cent increments will make it more profitable for investment banks to make markets in such securities, leading them to pursue more research about small companies, which could gener-

ate interest in the companies' shares. The ultimate hope is that widening tick sizes will boost liquidity.

Among the 10 firms in the first batch of issuers affected when the program is inaugurated on Monday are International Speedway Corp., a Daytona Beach, Fla., auto-racing promoter, and Bankrate Inc., a New York-based publisher of personal-finance content.

"I am excited to see how this pilot shakes out," said Lionel McBee, a spokesman for Erin Energy Corp., a Houston-based oil producer also in the pilot. "I think it could be really helpful for the small caps with liquidity and hopefully, ultimately, help with issues such as lack of analyst coverage."

Skeptics say such hopes are overblown, in part because the bid-offer spreads of many of the issuers in the pilot are already wider than a nickel. Some 61% of equities eligible for inclusion in the pilot trade for average spreads of \$0.05 to \$1, according to a study by Convergex, a brokerage firm.

Others have said that many market makers today are electronic trading firms that don't publish research in any case, rather than investment banks and brokerages that have equity analysts.

Still, market experts say the pilot could help create stickier bid and offer prices that hover at multiples of \$0.05, rather than jump up and down in frequent one-cent moves.

"What I think we're going to see is that we're going to see

the stocks that move to a nickel will have more depth on the quote and will have less volatility in their prices," said Frank Hatheway, chief economist at Nasdaq Inc.

A 2012 law, the Jumpstart Our Business Startups Act, required the SEC to study the impact of trading in penny increments on small and midsize companies. The commission in 2014 directed exchanges to draft the rules for the pilot program, which the regulator approved last year.

The roughly 1,200 issuers chosen for the pilot are listed on Nasdaq, the New York Stock Exchange or NYSE MKT, an exchange run by NYSE that specializes in small and midcap stocks.

The issuers were randomly distributed into three test groups of about 400 each. The rules for each test group are somewhat different, progressing from the loosest to the most stringent conditions.

In the first test group, price quotes for the issuers will be displayed in five-cent increments, but market makers may continue to execute trades at one-cent increments.

The second group will be quoted and traded at five-cent increments, with several exceptions. These include an exemption for midpoint executions, in which trades are executed halfway between the best bid and best offer, and an exemption for trades by retail investors.

The third group is subject to the same rules as the second group, but with some exceptions it is also subject to a "trade-at" requirement. This requirement is designed to force trades to be executed against orders displayed on-exchange, rather than being routed into dark pools or being executed against hidden orders in the exchanges' order books.

Meanwhile, a separate control group will continue trading in one-cent increments.

The program is set to run for two years. A preliminary report on the results is due in April 2018.

—Dave Michaels
contributed to this article.

Yale Beats Harvard—Again

BY HEATHER GILLERS

Yale University's endowment gained 3.4% during fiscal 2016, outearning rival Harvard University for the sixth year in a row.

The New Haven, Conn.-based school released its results Friday, one day after its Ivy League rival in Cambridge, Mass., announced a loss of 2% for the fiscal year ended June 30. The downturn was Harvard's worst investment performance since 2009.

Both schools outperformed others. College and university endowments tracked by Cambridge Associates posted net returns of minus-2.7% for the year ended June 30.

"Competing for endowment returns is just another way colleges and universities compete against their peers," said Catherine Konicki, partner at the endowments-and-foundations group of investment consulting firm NEPC.

Yale and other Ivies rely

heavily on their endowments to contribute to the cost of new buildings, student aid and professor salaries. Harvard's endowment is still the largest in the world, at \$35.7 billion as of June 30. Yale managed \$25.4 billion as of the same date.

Harvard University's endowment is still the largest in the world.

Both schools pioneered a shift in the endowment world from a plain-vanilla portfolio of stocks and bonds to alternative investments like hedge funds, private equity and real estate. One difference was that Harvard chose to manage some assets in-house, while Yale farmed out most of that work to external managers.

"Yale has decided that their strength is identifying the

smartest people and investing with them. And it works," said Charles Skorina, managing partner of the endowment and money-management search firm Charles A. Skorina & Co.

Harvard and Yale lost billions during the financial crisis, but Harvard has underperformed its rival since 2010, the last year its returns were better. Harvard also is searching for its fourth endowment leader in a decade following the July departure of Stephen Blyth. At Yale, investment chief David Swensen has been in charge for 31 years.

Yale didn't release details about its fiscal 2016 results Friday, but it did say that in fiscal 2017 hedge funds, private equity and venture capital could comprise 53.5% of its portfolio. That is up from a target of 51.5% in fiscal 2016. Domestic stocks won't go higher than 4%. Bonds and cash won't be above 7.5%.

—Dawn Lim
contributed to this article.

Hedge funds rethink strategies as university endowments suffer

Big university endowments, the most influential investors on earth, have just owned up to an awful year. The latest annual survey by Commonfund and the National Association of College and University Business Officers (Nacubo) reveals that most of the biggest funds took a loss.

Harvard, suffering ructions after two changes of chief executive in quick succession, and now abandoning its model of an internal team of managers, has hogged attention. Under new management, it will shift to the pattern of outside managers pioneered by David Swensen at Yale. .

But if Harvard's numbers were strikingly bad, it was not alone in its problems. Even Yale, still under Mr Swensen's leadership, suffered a small loss. Overall, with an average loss for all US university endowments of 1.9 per cent — also the loss for the biggest university endowments in the top 10 — this was their worst year since the crisis year of 2008.

Does this call even the Yale model into question? That depends on whether last year's conditions made it an outlier for the strategies that nowadays fill endowments. If so, they should avoid hasty changes to their model.

So far, the biggest endowments have stayed loyal to the model, and their key decision is no longer between bonds and equities, but between alternatives and all public market investments. Many followed Mr Swensen into alternatives, but the timing was unfortunate. Nacubo's numbers show that the endowments with more than \$1bn, made the switch in a hurry during the financial crisis.

Their weighting in alternatives went from 34.5 per cent in 2007 to 60 per cent in 2009. Since then it has wobbled only slightly, with last year's allocation to alternatives ticking up from 57 to 58 per cent.

That is a shame, because we now know that during the post-crisis rally the way to make money was to buy an S&P tracker fund and hold it.

US university endowments lost 1.9% making this their worst year since 2008

Meanwhile, last year turned out to be a downright dreadful year to adapt an alternatives-heavy allocation. Universities' fiscal year runs from July to June, to harmonise with the academic year. For the 12 months starting in July 2015 and ending with the Brexit referendum, the best asset class to be in was US treasuries. According to the Bloomberg EFFAS indices, long treasuries returned 19.8 per cent over that period, while the S&P 500 returned 4 per cent. Old-line endowments would have been just fine.

Small-caps and equities outside the US both lost money, so there was no reward for risk-taking there. Meanwhile, hedge funds failed miserably to take advantage of the choppy and rangebound conditions that are supposedly ideal for them. Absolute return hedge funds gained 0.6 per cent, according to the HFRX indices, while equity hedge funds, using all the firepower that comes with the ability to sell short and use leverage in a flat and choppy market, lost 8.3 per cent. An old-fashioned 60-40 investment, split between the S&P 500 and long treasuries, would have returned 10.3 per cent.

But this was a strange year. Stocks stalled with the end of quantitative easing in the US, and the world lapsed into a deflation scare. Maybe it was an *annus horribilis* for modern asset allocation. Just as it ended, there was a shift to a reflation trade that still continues, which could make returning to a heavy bonds weighting unwise. This was not, yet, good enough evidence to jettison the alternatives-led model.

However, even small endowments for whom a big holding of hedge funds is impractical fared poorly. Those with less than \$25m to manage had only 10 per cent in alternatives and still dropped 1.0 per cent. And this academic year looks a much fairer test. Treasuries have plunged, while absolute return hedge funds are holding their own, arguably. Academic year-to-date, a 60-40 allocation would have gained 1.1 per cent, while absolute return funds have also gained 1.1 per cent. Over the longer term the alternatives-based model still looks to be on rocky ground. Over the past 10 years, the average billion-dollar endowment has gained 5.7 per cent a year, which lags behind a 60/40 fund's return of 6.4 per cent.

University finance is becoming a political issue. Many bodies are restive about the fees they pay. If hedge funds cannot turn profits from the opportunities presented by the Trump trade, pressure to abandon them could grow extreme.

WSJ Sep 24, 2016

Source: 2016 Yale endowment update.

Investment Policy

Yale's portfolio is structured using a combination of academic theory and informed market judgment. The theoretical framework relies on mean-variance analysis, an approach developed by Nobel laureates James Tobin and Harry Markowitz, both of whom conducted work on this important portfolio management tool at Yale's Cowles Foundation. Using statistical techniques to combine expected returns, variances, and covariances of investment assets, Yale employs mean-variance analysis to estimate expected risk and return profiles of various asset allocation alternatives and to test sensitivity of results to changes in input assumptions.

Because investment management involves as much art as science, qualitative considerations play an extremely important role in portfolio decisions. The definition of an asset class is subjective, requiring precise distinctions where none exist. Returns and correlations are difficult to forecast. Historical data provide a guide, but must be modified to recognize structural changes and compensate for anomalous periods. Quantitative measures have difficulty incorporating factors such as market liquidity or the influence of significant, low-probability events. In spite of the operational challenges, the rigor required in conducting mean-variance analysis brings an important perspective to the asset allocation process.

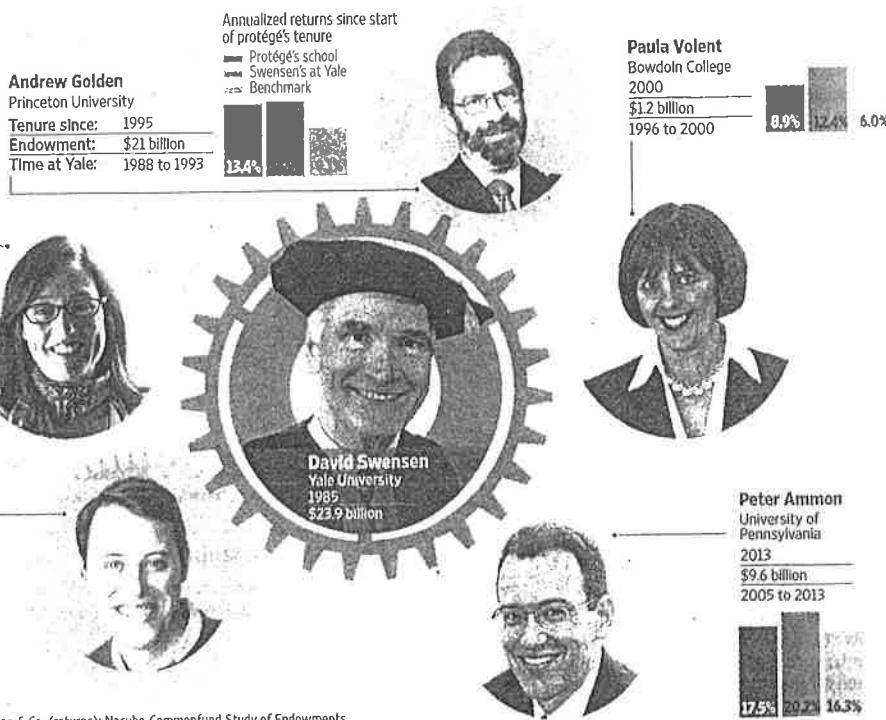
The combination of quantitative analysis and market judgment employed by Yale produces the following portfolio:

Asset Class	June 2016 Actual	June 2016 Target	Educational Institution Mean
Absolute Return	22.1%	22.5%	23.6%
Domestic Equity	4.0	4.0	19.6
Fixed Income	4.9	5.0	9.2
Foreign Equity	14.9	15.0	21.4
Leveraged Buyouts	14.7	15.0	6.1
Natural Resources	7.9	7.5	8.0
Real Estate	13.0	12.5	3.9
Venture Capital	16.2	16.0	4.9
Cash	2.3	2.5	3.5

Asset Allocation (as of June 30)	Fiscal Year				
	2016	2015	2014	2013	2012
Absolute Return	22.1%	20.5%	17.4%	17.8%	14.5%
Domestic Equity	4.0	3.9	3.9	5.9	5.8
Fixed Income	4.9	4.9	4.9	4.9	3.9
Foreign Equity	14.9	14.7	11.5	9.8	7.8
Leveraged Buyouts	14.7	16.2	19.3	21.9	24.3
Natural Resources	7.9	6.7	8.2	7.9	8.3
Real Estate	13.0	14.0	17.6	20.2	21.7
Venture Capital	16.2	16.3	13.7	10.0	11.0
Cash	2.3	2.8	3.5	1.6	2.7

The Swensen School

Former protégés of the Yale investment chief run some of the largest U.S. endowments.



Sources: the schools and Charles A. Skorina & Co. (returns); Nacubo-Commonfund Study of Endowments (endowment size); Wilshire Trust Universe Comparison Service (endowment benchmarks). Photographs clockwise from top: Princeton University; Bowdoin College; University of Pennsylvania; Yale University; MIT Investment Management Company.

Yale Investor's Acolytes Spread Word

BY TIMOTHY W. MARTIN

When hiring an investment chief, wealthy universities prefer something more specific than an Ivy League pedigree.

They ask: "Is there anyone at Yale?" said endowment recruiter David Barrett.

The demand for Yale University talent within the endowment world is a product of the success of David Swensen, manager of Yale's money for the last three decades. Mr. Swensen has earned a reputation as one of the world's most savvy investors with an unconventional approach that favors hedge funds and private equity over stocks and bonds. His annual return of 14.4% since 1985 has handily topped the S&P 500's 8.5%.

Universities looking to match Mr. Swensen's record and mimic his strategies are turning to his protégés for help. Four of the nation's 10 wealthiest schools have a former pupil of Mr. Swensen in charge following Stanford University's hiring last month of ex-Yale investment manager Robert Wallace. More than \$1 out of every \$6 held by all U.S. endowments is controlled by either Mr. Swensen or his former understudies, according to the National Association of College and University Business Officers and Commonfund.

Princeton University, the University of Pennsylvania, Bowdoin

College, Wesleyan University and the Massachusetts Institute of Technology all benefited from hiring one of Mr. Swensen's students, as their assets doubled and returns bested a benchmark

14.4%

Yale's annual rate of return since David Swensen became the university's money manager

of other U.S. endowments by at least a full percentage point, according to a Wall Street Journal analysis of data provided by the Wilshire Trust Universe Comparison Service, the schools and endowment recruiter Charles A. Skorina & Co.

The prevalence of Swensen acolytes in leadership posts highlights how dominant the Yale investment model has become among major U.S. universities. Colleges and universities ended 2014 with 51% of their portfolios invested in less-traditional fare like hedge funds, private equity and real estate that Yale favors—nearly double the allocation to those investments in 2001, according to annual surveys done by Nacubo and Commonfund.

Mr. Swensen wasn't alone in his early embrace of nontraditional investments. Jack Meyer,

former chief executive at Harvard Management Co. from 1990 to 2005, also produced outsize returns by investing heavily in private funds. During his tenure, Harvard's endowment ballooned more than fivefold and at \$36.4 billion it is still larger than Yale's \$23.9 billion, according to data as of June 30.

The model developed at Yale and Harvard isn't without skeptics, either. It relies on a long time horizon and heavier mix of illiquid assets, such as real estate and private equity, which can't easily be sold quickly. Many universities and colleges that piled into hedge funds, real estate and private-equity firms accrued big losses during the financial crisis. Even Yale pared back its target allocations to those types of private investments after 2008. Mr. Swensen declined to comment through a spokeswoman.

One Swensen apprentice, Anne Martin, said she immediately started shifting money into hedge funds and private-equity firms after arriving at Wesleyan in 2010 because "that's just the way I was trained to think."

Her Yale pedigree, she added, helped ease any concerns about adopting a more aggressive approach with the endowment's investment committee and administrators. She has earned 12.7% annually on average.

"Coming from Yale, it was hugely comforting for them. They felt just like they had hired someone out of GE," Ms. Martin said. General Electric Co. is renowned for consistently producing top-level executives.

Another Swensen protégé, Paula Volent, kept recalling a truism of Mr. Swensen's after she left Yale to run Bowdoin's endowment in 2000—find fund managers "who eat their own cooking." That was a reference to unearthing and cultivating talented external money managers who have personal stakes with their funds, rather than larger asset-gathering firms that carry higher fees and have less to personally lose, Ms. Volent said.



Jack Meyer, formerly of Harvard

She spent the next several years trying to gain access to top venture-capital managers and has earned 8.9% on average during her time at Bowdoin.

The first Yale trainee to take the top spot at another school, Andrew Golden of Princeton, said he tried to channel his inner Swensen after getting to Princeton in 1995, grilling potential managers and establishing a culture that stressed apprenticeship.

At Yale, he said, everyone's views were encouraged when debating investing strategies, from the newest junior associate up to Mr. Swensen and his longtime No. 2, Dean Takahashi. New staffers were invited to meetings where fund managers were vetted or investing decisions were finalized.

"Ninety percent of my good ideas on how to organize the office and develop a culture, I've stolen from Yale," Mr. Golden said.

Even playing on a softball team dubbed the "Stock Jocks"

'They felt just like they had hired someone out of GE,' Anne Martin says.

could be an opportunity for a pop quiz with the boss, Mr. Golden added. After one game Mr. Swensen asked for Mr. Golden's opinion on a fund manager over pizza and beers.

"This is like hour 14 of us being together today, and now you want to talk business again?" Mr. Golden said. "What that reflected was the total love of what he did."

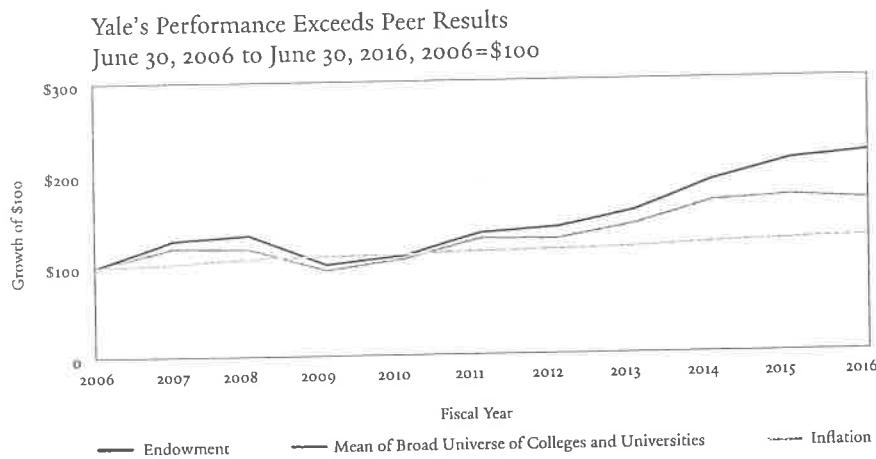
Only one former understudy—Seth Alexander at MIT—has topped the returns of their former boss during their tenure, according to a Wall Street Journal data analysis. Mr. Alexander has earned an average of 10.2% annually since 2006, compared with 9.9% for Mr. Swensen during that same time.

The other four are learning a fact other schools have long known: It isn't easy to beat Mr. Swensen. Princeton's Mr. Golden has posted annual returns of 13.4% since 1995, well above the 9.1% Wilshire benchmark, though below Yale's 13.9%. Peter Ammon at Penn, Ms. Martin at Wesleyan and Ms. Volent at Bowdoin also fell short of Yale's returns.

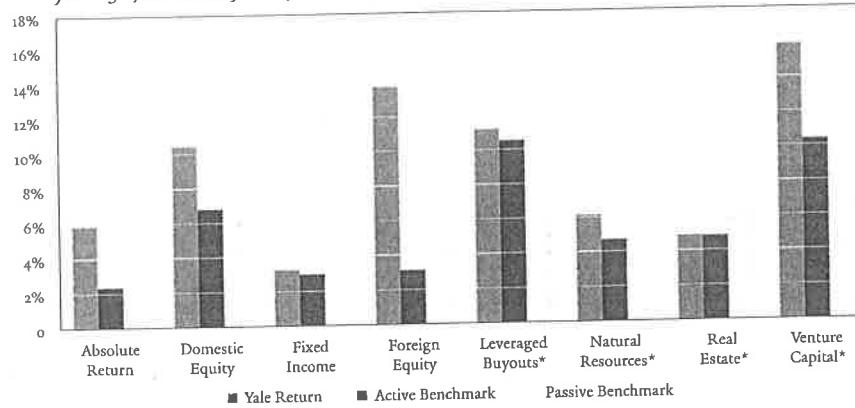
It is a challenge for any university to match Mr. Swensen's performance because of his experience and the near-unfettered access he has to top fund managers, said Charles Skorina, managing partner of the endowment search firm Charles A. Skorina.

"But part of it is just the Swensen touch," Mr. Skorina said. "He has a strategic nose for trends."

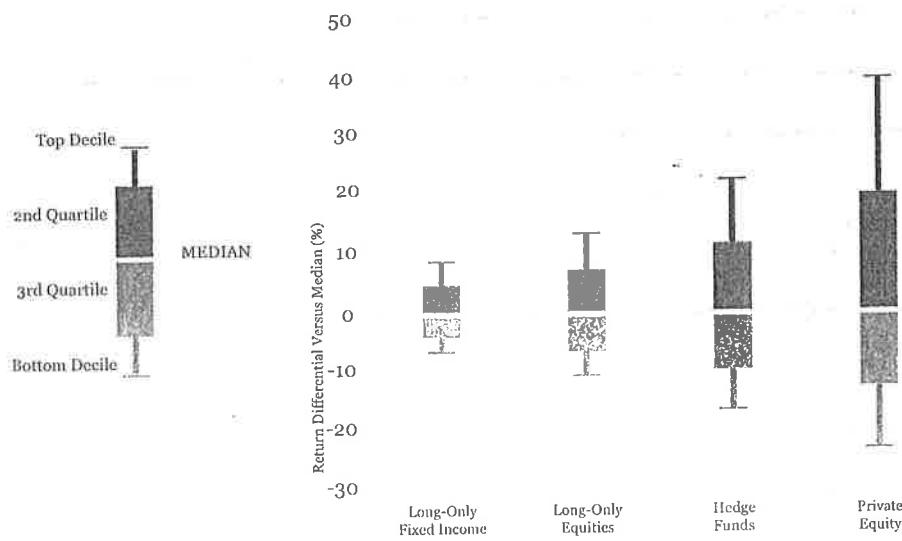
Source : 2016 Yale Endowment Update.



Yale Asset Class Results Beat Most Benchmarks
June 30, 2006 to June 30, 2016



*Display 6
Manager Dispersion Increases as Illiquidity Grows*



Source: Morningstar, Lipper Tass, Preqin
Note: Past performance is not indicative of future results. Should the study have been conducted over a different time period, the results may have been different.

Blackstone, 2014

Buttonwood |

When diversification doesn't work

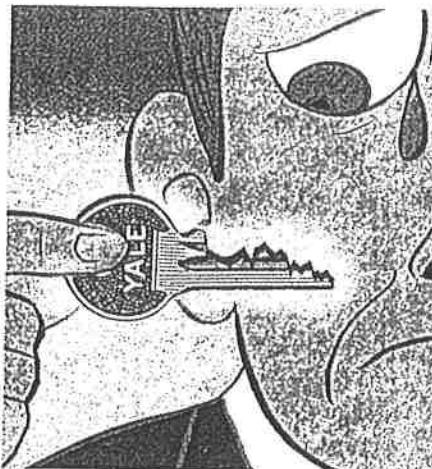
THREE can be fashions in investing as well as in the arts. Over the past 25 years many university endowments have moved over to the "Yale model", an investment strategy adopted by the Connecticut-based university in the 1980s. Under the leadership of David Swensen, Yale has invested across a wide range of "alternative assets", from private equity and hedge funds to timber.

The model has worked very well over the long run, for Yale at least. The university's private-equity assets have produced an annualised return of 30.4% since inception; the hedge-fund portion has returned 11.4% a year for the past ten years. The overall portfolio delivered an annual return of 11.8% over the ten years to 2009, easily beating the average endowment.

One idea behind the Yale strategy was that endowments have the luxury of time, since their liabilities (paying for new buildings, academic salaries and so on) stretch far into the future. They can thus afford to invest in illiquid asset classes. Such asset classes may offer a better return simply because other investors (mutual funds, for example) are unwilling or unable to deal with illiquidity.

In addition, the traditional dominance of domestic equities within institutional portfolios put lots of eggs in one basket. There were other sources of return—the management skills of private-equity houses, the market for distressed bonds—where the trade-off between risk and reward might be better than could be obtained from the S&P 500 index.

But the model came into question in 2008 and 2009, when the financial crisis hit. In the year to June 30th 2009, the Yale endowment fell by 24.6% and Harvard's portfolio fell by 27.3%, losing the latter a whopping \$10 billion (there has been a modest recovery since then). The illiquid-



ity of the portfolios counted against them.

The broader question is whether what worked for Yale and Harvard, for a time, can be a successful strategy for a much broader range of universities over a much longer period. Yale, in particular, has a first-mover advantage; by being an early investor in private equity it was able to get access to the best-managed funds. Later endowments found that some of these funds were closed to new money and were forced to settle for less talented managers and more modest returns.

Another problem is that diversification means more than simply a willingness to invest across a wide range of asset classes. It also requires taking a separate stance from the herd. Some asset classes (particularly illiquid ones) can be subject to a "rowing boat" effect. Mortgage-backed securities were a classic example. Everyone rushes into them, so the price rises sharply and investors pat themselves on the back for their shrewdness. Then something happens to change sentiment. As everyone tries to rush out of the asset, the boat

capsizes. The additional returns achieved during the boom turn out to be illusory.

Martin Leibowitz of Morgan Stanley has analysed the characteristics of endowment portfolios over the past ten years. He looked at three portfolios: a classic 60/40 US equity/Treasury bonds split; a Yale-like portfolio with seven separate asset classes; and a portfolio with international diversification but without the illiquid private-equity, hedge-fund and real-estate portions. What is remarkable about these portfolios is how closely correlated they all are with the S&P 500. Even the Yale-like portfolio had a correlation of more than 0.9 (where 1 is a perfect fit).

Another way to measure relationship with the market is "beta". An asset with a beta of more than 1 rises more than the market in bull phases (or falls more when the market drops); an asset with a beta of less than 1 moves less violently.

Sadly for the Yale-like portfolio, its beta rose sharply in the third quarter of 2008 when the market was in turmoil as Lehman collapsed. The beta then fell again as the market recovered in 2009 and 2010. In short, the benefits of diversification were highly diluted. In beta terms, endowment portfolios traded like a traditional 60/40 fund in the boom and then were more volatile in the bust.

Those results ought to weigh on the minds of those planning to follow the Yale example. After all, institutional investors are able these days to invest in the main asset categories for very low fees of just a fraction of a percentage point. Handing over an annual fee of 1.2%, plus a 20% performance fee, to an alternative-asset manager throws away that advantage. As 2008 showed, the asset managers get rich but the investors still get clobbered.

Liquidity

Since market participants routinely overpay for liquidity and since less liquid markets exhibit more inefficiencies than their liquid counterparts, illiquid markets create opportunities for astute investors to identify mispricings and generate outsized returns. Furthermore, operational, strategic, and company-building skills of control-oriented, illiquid asset managers can add tremendous value to portfolio holdings. Investors willing to accept less liquid alternatives enhance the opportunity to outperform the market. Intelligent pursuit of illiquidity is well suited to endowments, which operate with extremely long time horizons.

Yale's belief in the attractive market opportunity among less liquid assets led the University to allocate a significant portion of the Endowment to the illiquid assets of private equity, real estate, and natural resources. Yale maintains a reasonable allocation to marketable asset classes, however, in order to preserve sufficient liquidity to support current University operations, satisfy capital commitments to investment partnerships, take advantage of attractive investment opportunities, and provide support for the University's financing activities.

The evaporation of liquidity during the financial crisis highlighted the importance of prudent liquidity management. Because Yale had long recognized the necessity of understanding and monitoring the Endowment's liquidity profile, the University had substantial internal and external sources of liquidity at its disposal. Even a portfolio characterized by high percentages of illiquid, long-term assets contains more liquidity than might be immediately apparent. Yale's holdings generate a fair amount of natural liquidity: bonds pay interest, stocks

pay dividends, real estate produces rents, energy reserves provide both returns on capital and returns of capital (through depletion), and private equity partnerships distribute proceeds from realizations. The Investments Office carefully forecasts how these distributions will behave under a range of economic scenarios.

Holdings of marketable securities provide a source of non-disruptive liquidity, namely liquidity generated in a manner that does not change the Endowment's asset class exposure. For example, bonds and stocks can serve as collateral for repurchase agreements (repos) and security lending, respectively. The owner of the securities generates liquidity through proceeds produced by the repo and security lending activity, while retaining the economic exposure associated with the securities.

External borrowing represents another source of non-disruptive liquidity. As a result of Yale's planning well before the advent of the crisis, the University had access to nearly \$2 billion of commercial paper funding, a level substantially in excess of the University's crisis-related needs. In November 2009, after the crisis subsided, Yale issued \$1 billion of five-year fixed-rate taxable bonds with attractive pricing to refund the commercial paper draws. That debt is now largely repaid.

In the late 1990s, Yale developed a flexible and responsive model for projecting illiquid fund contributions, distributions, and net asset values based on the levels of future fund commitments, asset class investment returns, the pace of fund commitment calls and fund distributions, and overall Endowment returns. Yale Investments Office Senior Director Dean

Takahashi and former Director Seth Alexander's article, "Illiquid Alternative Asset Fund Modeling," published in the *Journal of Portfolio Management* in winter 2002, described Yale's illiquid asset model.

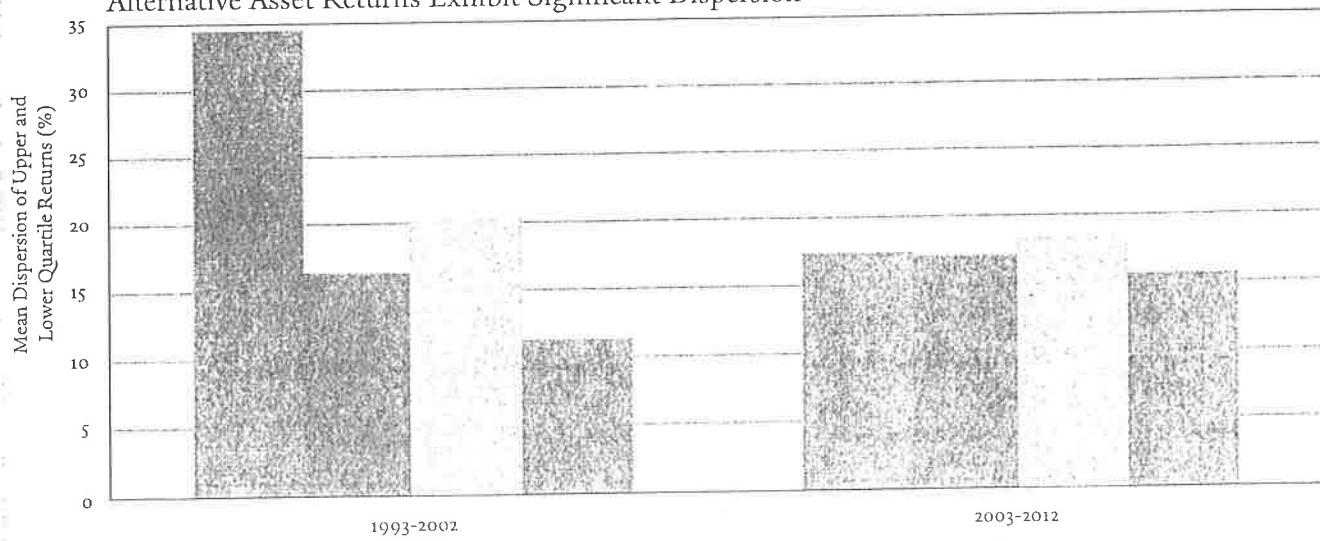
Yale continues to use the same basic model, albeit with some improvements and modifications. The Investments Office periodically revises model parameters to reflect historical experience and incorporates adjustments reflecting current market conditions. For instance, during the financial meltdown, the model was adjusted to depress Endowment growth rates and reflect the anticipated slower pace of capital calls and distributions. Furthermore, the Investments Office employs the illiquid asset model to stress-test Yale's liquidity position under a range of economic scenarios.

High-quality forecasting tools elucidated the Endowment's liquidity position during the financial crisis and enabled Yale to steer the Endowment through the crisis with sufficient liquidity. The Endowment met all of its liquidity requirements, including private equity, real estate, and natural resources capital calls; spending distributions for University operations; and debt repayments.

Economic and financial market turbulence during 2008 and 2009 highlighted the importance of monitoring and managing Endowment liquidity. Fortunately, Yale's careful forecasting and in-place liquidity mechanisms enabled the University to meet its cash needs. Although the financial crisis has passed, liquidity management and monitoring remain ongoing Endowment priorities and the Investments Office continues to refine and test its liquidity model.

Alternative Asset Returns Exhibit Significant Dispersion

Source: Cambridge Associates



The Yale Model

The Yale model of endowment investing has come under intense scrutiny for its performance during the recent financial crisis. Skeptics suggest that the Yale Endowment, with its emphasis on diversification and active management of equity-oriented, often-illiquid assets, failed to deliver on its promise.

Critics argue that Yale's model lacked diversification in times of crisis, evidenced by the Endowment's 24.6 percent decline for the fiscal year ending June 30, 2009. In the global financial crisis, as in the 1998 Asian financial crisis and the 1987 stock market crash, global markets exhibited concurrent broad-based declines. Correlations of risky assets increased markedly as market participants expressed extreme preferences for liquidity and quality. While these were painful periods for equity-oriented investors, they were short lived as individual countries and markets soon reverted to fluctuating in response to country- and asset-specific drivers of performance. During the bleak period of poor performance and high correlation, full faith and credit holdings of the U.S. government provided the only safe harbor. The short-term protection to investor portfolios provided by U.S. Treasury securities comes at a high long-term price, however. Expected returns for fixed income instruments fall short of expected returns for equity-

oriented investments and, over long periods of time, fail to generate the returns required to support current University operations while preserving the purchasing power of assets.

Yale's portfolio, positioned for strong long-term returns, lacked significant exposure to low-expected-return Treasury securities and suffered in the market meltdown. The Endowment's decline of 24.6 percent underperformed peer returns of -22.0 percent and a classic 60 percent U.S. equity and 40 percent Treasury bond portfolio return of -13.2 percent. Critics presented Yale's short-term underperformance as validation of traditional asset allocations focused heavily on public equities and fixed income. Although the Endowment produced painful losses in fiscal 2009, the results of any one-year period tell very little about the efficacy of a long-term investment strategy. Performance over longer horizons demonstrates the strength of Yale's investment program.

While Yale's diversified, equity-oriented portfolio underperformed during the financial crisis, it handsomely outperformed a traditional U.S. stock and bond portfolio over the past twenty-five years. If Yale's assets had been invested in the 60 percent equity/40 percent bond portfolio since 1988, the Endowment would be valued at only \$9.11 billion today, less than

half of its current value of \$20.78 billion. Furthermore, the spending distribution to fund University operations during fiscal 2013 would have totaled approximately \$440 million, significantly below Yale's actual spending distribution of \$1.02 billion. Cumulative spending over the twenty-five-year period would have been approximately 40 percent below actual spending levels, which surpassed \$11.60 billion for the period.

In periods both before and after the crisis, Yale's Endowment performed admirably. In nine of the past ten years, the University's ten-year returns stood atop the Cambridge Associates universe. In fiscal 2004, when Yale failed to post the top ten-year return, the University placed second. Even in an environment that included an extraordinary financial crisis, the Yale model excelled.

While traditional asset allocations held up well during fiscal 2009 and in the immediate aftermath of the crisis, that short-term outperformance came at a heavy cost to the growth of a portfolio's value over the long term. During periods when traditional portfolios outperform, critics are quick to cast aspersions on the Yale model, but traditional 60 percent equity/40 percent bond portfolios are not diversified, not equity-oriented, and not appropriate for long-term investors.

Lessons from the Crisis

The financial crisis highlighted a number of important issues and lessons that investors would be wise to heed. The crisis made clear the importance of a long-term orientation and underscored the need to support a diversified, equity-oriented, active-management strategy with adequate organizational resources and capabilities.

Organizations, investment teams, and committees that lack commitment to a long time horizon make sub-optimal decisions during periods of tumult and uncertainty. During 2008 and 2009, for example, some institutions overreacted to short-term concerns surrounding portfolio performance and volatility, choosing to reduce equity exposure near the market's nadir. Yale instead sought to maintain equity exposure, aggressively managing liquidity and prudently employing debt. Similarly, after the October 1987 stock market crash, Yale made a rebalancing purchase of nearly \$100 million of equities (representing more than 5% of Endowment value) funded by a corresponding sale of nearly \$100 million of bonds. In the context of crisis-induced gloom, Yale's actions appeared rash, particularly as many institutions

responded to market declines by further reducing their already diminished equity exposure. In both cases, however, as markets rebounded, Yale's equity positions produced outsized returns. Those that chose an untimely reversal of strategy missed the benefits of the recovery.

The crisis emphasized that the Yale model is only appropriate for organizations with a strong, dedicated, and skilled investment staff. Although the fundamental principles of the Yale model are straightforward, execution of an active management strategy demands a significant commitment of resources, particularly during chaotic and uncertain times. Identifying high-quality active managers with the ability to generate alpha consistently requires dedicated sourcing, researching, and monitoring of investment funds. Demands on management are amplified during market dislocations when sensibly reallocating funds between managers and making challenging rebalancing decisions depend upon the knowledge and input of experienced investment staff. Establishing and maintaining an unconventional investment profile require acceptance of uncomfortably

idiosyncratic portfolios, which can, at times, appear imprudent. Unless institutions maintain contrarian positions through difficult times, the resulting damage of buying high and selling low imposes severe financial and reputational costs.

The financial crisis highlighted the importance of understanding, forecasting, and managing portfolio liquidity, which can change dramatically during periods of turmoil. Investors with large allocations to illiquid assets must possess a sophisticated understanding of the liquidity tools at their disposal and must dedicate sufficient organizational resources to modeling, tracking, and stress-testing portfolio liquidity.

The Yale model of endowment investing is not appropriate for everyone. Investors must address the particular investment policy needs of their institutions and take into consideration their resources and temperament. Only those organizations with a true long-term perspective and sufficient staff resources should pursue an active, equity-oriented, alternatives-focused investment strategy. The costly game of active management guarantees failure for the casual participant.

Harvard Tests Market for Its Property Bets

Harvard University's \$26 billion endowment is looking to unload a chunk of its \$5 billion real-estate portfolio as it seeks better investment opportunities and to reduce its exposure to the troubled property market.

The university's endowment is willing to sell any part of its \$5 billion of real-estate assets and accompanying future capital commitments, say people familiar with the matter. That figure represents \$2 billion in property holdings and an additional \$3 billion in future commitments to those assets.

The endowment, however, intends to sell only up to \$500 million in those assets and fu-

By Shayndi Raice,
Craig Karmin
And Shelly Banjo

ture commitments, according to people familiar with the matter. Harvard also has indicated that it intends to maintain an ownership position of at least 51% in each of the real-estate partnerships, a requirement that may frighten away potential buyers.

Harvard already faces a challenging environment for selling real-estate positions. A number of its investment funds were launched around the top of the market, and they have been hit

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Continued from page C1

hard in the downturn. Generally, property funds have been offered for as much as 80% below net asset value, industry experts say, and investment managers continue to mark down the value of the commercial real estate they own.

Harvard's own real-estate portfolio "suffered a loss of over 50%" for the fiscal year ended in June, according to a September report from Jane Mendillo, head of the company that manages the endowment, the nation's largest. Harvard's endowment posted miserable overall returns last year, declining 27.3% for the year that ended in June.

In November, Harvard began marketing a portfolio of stakes in more than 30 real-estate funds, ranging in size from \$50 million to \$500 million through Credit Suisse Group, according to several secondary-market buyers and intermediary firms familiar with the offering.

Some of the largest commitments are with real-estate-investment companies such as

Beacon Capital Partners, Lumber Capital Partners, Lone Star Funds and Westbrook Partners, according to documents reviewed by The Wall Street Journal. Close to 60% of the funds are in North America, but there are also a number of commitments with real-estate companies in Europe, Asia and South America, according to the documents.

A spokesman for Credit Suisse declined to comment.

The sale represents Harvard's latest effort to reduce exposure to hard-to-sell assets like real estate, commodities and private equity. Like many of the nation's elite universities, Harvard suffered a cash crunch during the 2008 financial crisis that caused the endowment to sell some of its more-liquid securities, like public stocks, to meet certain financial obligations.

Harvard also tried to sell in the secondary market about \$1.5 billion in private-equity

partnerships but pulled them back after receiving bids for around 50 cents on the dollar.

It later sold off some of its private-equity stakes in smaller, more discreet transactions.

Harvard officials have become particularly concerned about the billions of dollars in future commitments attached to real-estate and private-equity holdings, which makes the endowment portfolio less liquid and more vulnerable to another cash-pinch in crisis periods.

Harvard has used some of the proceeds from its sales to build a cash reserve of about 2% of the portfolio, compared to a negative 5% cash position in the recent past, Ms. Mendillo said at a recent endowment conference. The university also borrowed \$1.5 billion in taxable debt in December 2008.

Liquidity pressures are likely to persist at large endowments that for decades kept little to

no cash on hand, said Stewart Massey, an endowment consultant at Massey, Quick & Co. "Endowments and foundations are going through a period of restructuring where the foremost thing on their minds will be liquidity, even if that means giving up return and taking in some losses," he says.

Harvard's sales approach is similar to a strategy employed by Stanford University, which late last year said it was taking offers on all of its \$5.5 billion in illiquid assets, including private equity, real estate and natural resources.

The endowment also intended to sell only partial interests in these partnerships. In December, Stanford decided to call off the auction rather than sell at prices ranging from 80 to 85 cents on the dollar offered for some of the most desirable partnerships, people familiar with the matter said.

Similarly, Harvard officials are maintaining that they won't sell assets too cheaply, according to a person familiar with the endowment.



Jane Mendillo

Yale Will Stick With Its Investment Model

BY GINA CHON

Anyone expecting a mea culpa from Yale University's investment chief can forget it.

Despite criticism of the "Yale model" of investing amid the financial crisis, the school stood by Chief Investment Officer David Swensen's methods in its 2009 endowment report, released Thursday.

"Some observers questioned the University's investment philosophy, which rests on the principles of diversification and equity orientation," the report said. But it maintained that Yale's approach still lowered risks and diversified returns.

The endowment in fact increased its allocations to illiquid, or hard to sell, assets that caused some funds trouble when markets cratered, such as private equity and real estate, according to the report, which wasn't signed by any single individual.

Mr. Swensen, Yale's CIO since 1987, gained followers after he began investing heavily in non-traditional assets, which he said could produce higher returns than stocks and bonds with the right managers. Yale saw record returns and had a 20-year record of positive gains.

But Yale's endowment declined by 24.6% for the fiscal year that ended June 30, and many other schools with similar approaches, like Harvard University, also faced double-digit declines. That caused some observers to question Mr. Swensen's philosophy; some, like Harvard, are now reducing their exposure to real estate and are trying to increase liquidity.

At the endowment investment committee's meeting last June, the target allocation to private equity was increased from 21% to 26%, the report says. That compares with an 8.3% actual allocation of the average educational institution, the report said.

The report said private-equity investments have generated a 30.4% annualized return since the portfolio was created in 1973, although such investments generated a 24.3% loss in the last fiscal year.

Liquidity is a concern for endowment managers, the report acknowledged. But it said some illiquid assets can be used to create liquidity, for example as collateral for loans.

In the 2009 fiscal year, the endowment provided 46% of Yale's \$2.56 billion operating income.



David Swensen

Yale's Investor Keeps Playbook

In Line for First Loss Since '88, Mr. Swensen Still Champions 'Alternatives'

BY CRAIG KARMIN

HE ISN'T a household name. But as the Yale University's endowment's chief investment officer for two decades, David Swensen has earned a reputation as one of the world's savviest and most successful investors.

He pioneered an approach that de-emphasized stocks and bonds while embracing less-traditional fare like hedge funds, private equity, and oil and gas. During his tenure, Yale has had an average annual return of 16% for the past 10 years through June, compared with a 2% average for the Standard & Poor's 500-stock index. Yale's assets more than tripled over that period to \$23 billion, trailing only Harvard University's in size.

Yet even Yale hasn't escaped the financial crisis.

The university estimated late last month that the endowment had lost 25% of its value since the end of June. That is expected to lead to budget cuts and puts Mr. Swensen in line for his first negative fiscal year since 1988. Other endowments that have set out to follow the strategy he has advocated are also suffering.

Nonetheless, Mr. Swensen is sticking to the same investment approach that he's used in the past. He describes that process in detail in his book, "Pioneering Portfolio Management," which he revised and which was reissued this month.

He spoke to The Wall Street Journal about the financial crisis, hedge funds, scandal-scarred money manager Bernard Madoff, and ill-fated efforts to mimic Yale's investment strategy. Here are questions and his answers,



David Swensen, investment chief for Yale University's endowment, says institutional investors should be built for growth, not to withstand stock-market downturns.

edited for context and clarity.

Wall Street Journal: As you revised your book, first published in 2000, did any sections strike you as dated?

David Swensen: It was more in the other direction. The book talked about an approach to investing that has succeeded over the past decade. In the '90s, all you had to do was put your money in the S&P 500. In the ensuing decade, a diversified strategy just crushed the S&P. The

book talks about a sensible approach that was also profitable."

WSJ: Yet, other endowments have attempted a Yale-like approach, usually with less success. What goes wrong?

Mr. Swensen: A lot of institutional investors think they are emulating Yale, but they are not. Most endowments use fund of funds and consultants, rather than making their own well-informed decisions. You can divide institutional investors into two

camps: those who can hire high-quality, active-management investors and those who can't. If you are going to invest in alternatives, you should be all in, and do it the way Yale does it—with 20 to 25 investment professionals who devote their careers to looking for investment opportunities. Or you belong at the other end, with a portfolio exclusively in index funds with low fees. If you're not going to put together a team that can make high-quality

Please turn to page C3

Continued from page C1
ity decisions, your best alternative is passive investing. With a casual attempt to beat the market, you're going to fail.

If someone looked at what we're doing superficially and made superficial attempts to copy us, then I have little sympathy for them. It's a much more complicated process than that, and I explain it in detail in the book. If someone read my book and failed, I'd have some sympathy.

WSJ: What about fund of funds and consultants? Can they be a solution?

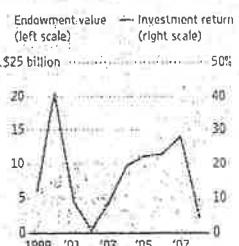
Mr. Swensen: Fund of funds are a cancer on the institutional-investor world. They facilitate the flow of ignorant capital. If an investor can't make an intelligent decision about picking managers, how can he make an intelligent decision about picking a fund-of-funds manager who will be selecting hedge funds? There's also more fees on top of existing fees. And the best managers don't want fund-of-fund money because it is unreliable. You need to be in the top 10% of hedge funds to succeed. In a fund of funds, you will likely be excluded from the best managers. [Mr.] Madoff also relied enormously on these intermediaries. He wouldn't have had nearly as much resources were it not for fund of funds.

Consultants make money by giving advice to as many people as possible. But you outperform by finding inefficiencies most of the market has not yet uncovered. So consultants ultimately end up doing a disservice to investors.

WSJ: Does the poor performance of most assets last year suggest you need to tinker with the endowment's portfolio to better withstand another year like 2008?

Mr. Swensen: I don't think it makes sense for an institutional investor with as long an investment horizon as Yale's to struc-

Head of the Class
Yale endowment has been a leader in returns over the past decade



Source: Yale

ture a portfolio to perform well in a period of financial crisis. That would require moving away from equity-oriented investments

that have served institutions with long time horizons well.

WSJ: With hedge funds suffering their worst year on record, will institutional investors have more power to demand lower fees?

Mr. Swensen: Put that in the category of wishful thinking. It would be nice if fees were not so onerous. But you still have investors who are happy to pay a high price in hopes of getting the holy grail of extraordinary returns.

WSJ: Many hedge funds share little information with investors beyond their general strategy. Is that acceptable?

Mr. Swensen: We require complete transparency. We either know every position, or we don't invest. I have access to every position in every hedge fund in which we're invested. If they won't trust us with that information, why should we trust them with our money?

WSJ: Looking ahead, what investments do you like?

Mr. Swensen: Distressed securities are one of the most interesting

opportunities for institutional investors. But returns won't come right away because the credit markets are fundamentally broken. TIPS [Treasury-Inflation Protected Securities] are pretty attractively priced. They promise reasonable returns, and protection against inflation is really important. We may not see it in the next year or two, but the government's massive fiscal stimulus can't help but produce massive inflationary pressures. Stocks also look a lot more attractive than they have for along time. We prefer higher-quality companies with low leverage.

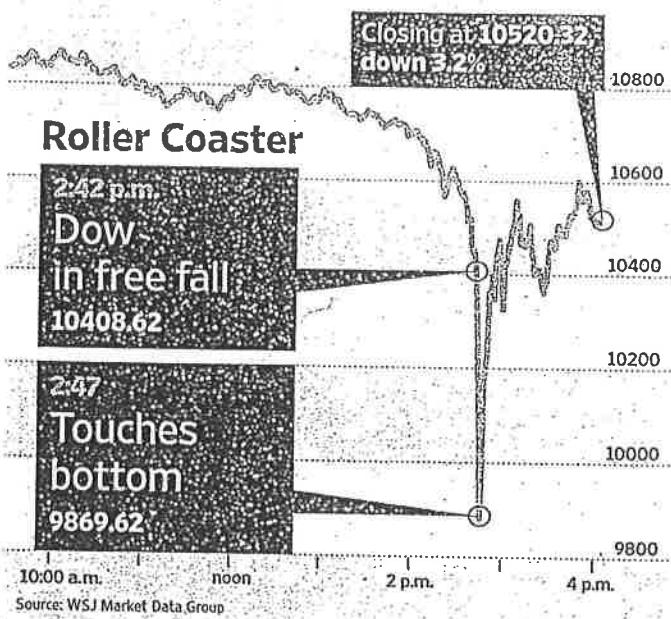
WSJ: Your compensation has been as much as \$2 million a year. Are you and other endowment managers are paid too much?

Mr. Swensen: Compensation in the investment-management world, broadly defined, is excessive. Not-for-profits have not exhibited the same excesses as the private sector. But the amount that endowment and foundation investment managers get paid is extremely generous.

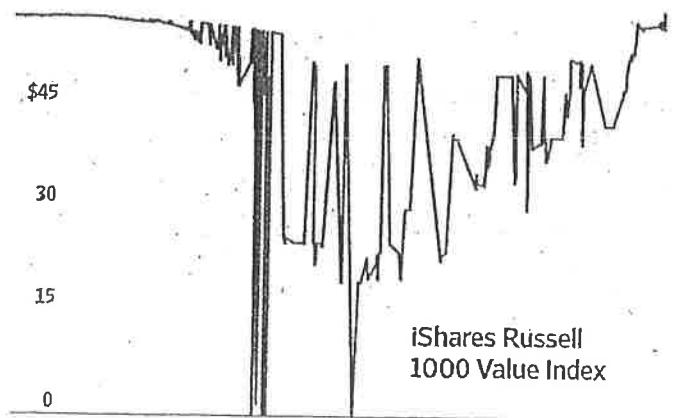
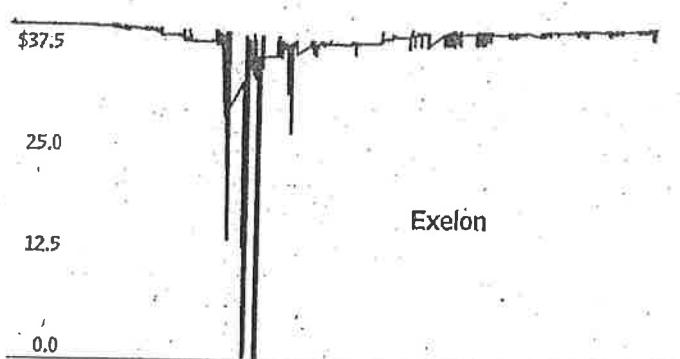
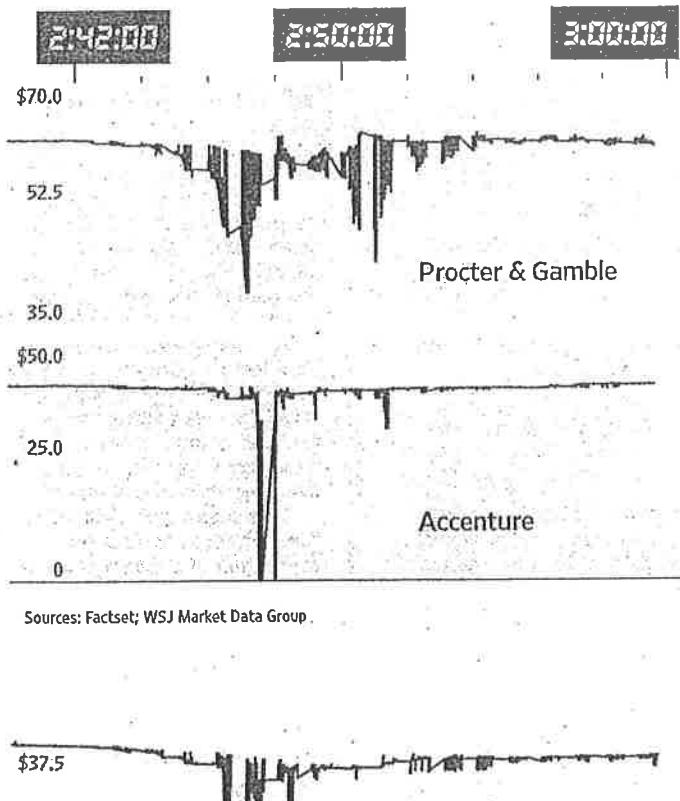
WSJ: Amid the Bernard Madoff scandal, there has been criticism of a university for investing in a fund that was run by someone on its investment committee. The fund, it turns out, was invested with Mr. Madoff. What's your view on that issue?

Mr. Swensen: Yale doesn't have a rule that we can't invest with someone on our investment committee.

Mr. Swensen: Such a rule would diminish the overall quality of our investment committee quite dramatically. But members don't participate in deliberations about whether to invest in their funds. For as many times as I have recommended an investment with a committee member, I have recommended against. You have to be tough about it and only recommend those things that make an enormous amount of sense for the institution.



Tremors | Share prices during Thursday's plunge



'Hell' breaks loose in two minutes of currency trading room bedlam

Nerves over future of Europe and rogue algorithms among reasons proffered for sterling's nosedive

JENNIFER HUGHES — HONG KONG
LEO LEWIS — TOKYO

Currency trading in Asia follows a pattern on Fridays: it starts slowly, grudgingly cranks up as Singapore comes online, then eases once traders in London reach their desks. At that point, the region's dealing rooms begin thinking about the weekend.

Add in a Chinese bank holiday as well as looming long weekends for Tokyo and Hong Kong, and the prospects for dramatic moves yesterday looked even lower. On top of that, it was also a "payrolls Friday", where impeding US jobs data early in the New York day tend to damp action globally as investors prepare for the all-important numbers.

By 10am in Sydney, traders were on their second coffee while those in Tokyo, two hours behind, were getting into work. An hour behind them were Hong Kong and Singapore, mostly still on their way to the office at 7am — midnight in London. Few saw much point in being early on a quiet payrolls day.

But those at their desks then saw something extraordinary: the pound began plunging at an unheard-of rate against the dollar — and for no discernible reason. It was also tumbling faster than it had on the night of the Brexit vote in June, when it lost 11 per cent.

"The post-Brexit move was a swallow dive. This was a sudden bang," said Ray Attrill, global co-head of FX strategy at National Australia Bank.

Sterling had been weakening throughout the week, hitting 31-year lows as investors feared the UK was heading for a "hard Brexit". The slide began after a speech from Theresa May, the UK prime minister, to her Conservative party's conference, in which she talked tough on Brexit. But yesterday's action was something else.

"I've been trading sterling since 1978 through every crisis it has seen, and I've not seen anything like this," said Ian Johnson, FX strategist at 4Cast.

The next hour in dealing rooms across Asia was bedlam. Traders, investors and journalists sought answers to the basic question: what on earth happened? The answer is still unclear.

The move began at 7.07am Hong Kong/Singapore time. To be even more precise, it was 7 minutes and 3 seconds past the hour, according to the trading records of one bank, seen by the FT.

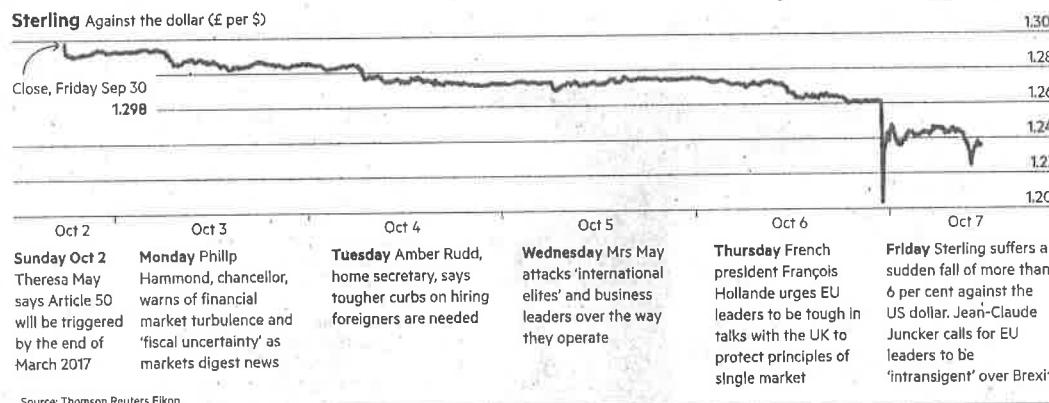
Up until that point, sterling had been trading just above \$1.26 against the dollar. In less than 20 seconds it dropped below \$1.25 and was rapidly nearing \$1.24. "The move down from \$1.26 to below \$1.25 was orderly in the sense that bid-ask [buy-sell] spreads were normal — but not once we got down through \$1.24," said one Sydney-based trader. "That was when all hell broke loose."

Sterling-dollar is the third most-traded currency pair in the world. To move two "big figures" in trade parlance — two cents in this case — in less than a minute is as heart-stopping as it is rare.

Theresa May: British PM's signal of 'hard Brexit' has roiled markets



Chris Ratcliffe/Bloomberg



Trading

Working out low point is a challenge

Finding sterling's low for the day is a trickier question than it sounds.

The problem with finding the actual low is that currencies are traded on dozens of platforms, and the levels each shows reflect the trades that are conducted on that particular system. In normal market conditions, this makes little difference, if any. The Thursday-to-Friday overnight move was not normal.

EBS, the trading platform and one of the central points of reference, particularly for sterling, says it is taking \$1.1938 as the lowest point. Bloomberg's reported low is \$1.1841. Thomson Reuters is the outlier. At one point, the system reported a trade at \$1.1378, way below the other big platforms. That has since been scrubbed from the system. (There are a number of reasons that may have happened, such as the volumes being too small to matter.) It is, however, standing by an absolute low of \$1.1491 in a trade at 11.07pm GMT, or 7.07am Hong Kong time, which is when the plunge began.

That is not all. Reuters is also publishing a "market low" where a "good amount" — £5m or more — was traded within a three-minute window. This low was \$1.15 and happened "around the same time as the absolute low".

Anyone with trades on when sterling crashed is watching carefully as it helps determine who pays whom among holders of options and other currency contracts. It will not be easy to work this one out. Katie Martin and Jennifer Hughes

It got worse: by 7.09am it had fallen to \$1.1841, according to Bloomberg data. Other trading platforms made it look even more shocking. Thomson Reuters' trading system recorded a trade at \$1.1491 at 7.07am (it would not give the second) and concluded the actual "market low" — a price traded at least a handful of times — was \$1.1500.

By this point, the hunt for explanations was on. First in the crosshairs were algorithmic traders — those whose trading is automated based on mathematical formulas. An algorithm could have gone rogue, suggested analysts. Others thought it was more likely that they simply exacerbated the move, since algorithms are often programmed to follow market momentum.

That seems likely. Sterling's move had already taken it from \$1.295 at the end of last week to \$1.265 later on Thursday. No one expected much of yesterday although at least a few, shaken by the pound's volatility since June's Brexit vote, had placed complex options trades that would pay out if sterling broke below \$1.25 or above \$1.29. That sudden dive below \$1.25 caused market momentum to pick up sharply when it triggered orders placed by banks on the other side of those options trades to limit their losses.

Amid the technical markets explanations, Brexit was also blamed. In particular, fingers were pointed at François Hollande, the French president. His own tough stance on the UK's negotiations to leave the EU were published in a FT story at 7.07am Hong Kong time. But that story actually

went live 13 seconds in — that is, 10 seconds after the move began.

Other Brexit-related reasons came thick and fast. Corporate Japan's rising concern over the UK's exit from the EU was seen as a particular pressure on the pound in Asian hours.

One Tokyo-based hedge fund manager said: "It is not that the Japanese corporate support for sterling has completely evaporated. It is just that the market is being given a lot of strong signals that it could do so very quickly, so [it is] very difficult not to start betting it will happen."

He pointed to suggestions by Nomura and Daiwa this week that they could take at least some operations out of London. Nissan has already said it is delaying UK investment plans over Brexit. "All of this [sterling's plunge] came after Theresa May's speech, and we already know the carmakers are worried, so it is anyone's guess where the real support level comes," added the hedge funder.

One theory suggested the move might not have been so extreme were traders still able to talk to their counterpart elsewhere.

Online chat rooms populated by multiple bank traders were once common but are now largely banned following cases of rate-rigging.

Traders dismissed that, however, noting that the crash took just two minutes.

"How fast do you think we can talk?" asked one.

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Editorial Comment page 10
See Lex and Markets

Computers Eyed in Pound Plunge

Unusual intraday move of 6% triggers concerns about automated trading

By MIKE BIRD
AND SAUMYA VAISHAMPAYAN

LONDON—For a startling moment on Friday, the British pound crashed.

In just three minutes shortly after 7 a.m. Hong Kong time, the pound sank 6% to as low as \$1.18, according to Thomson Reuters data. Some electronic platforms recorded

scattered trades near \$1.15. For the currency markets, where moves are recorded in thousandths of a penny, it seemed that currency traders were all hiding under their desks.

But the most accepted scenario was that computers, not humans, were the ones that refused to buy. Coming at the most thinly traded moment of the global trading day, the latest "flash crash" once again showed how algorithmically driven trading programs have rewired the global finance game.

The pound's gyration Friday was the second largest intra-

day move from its highest to lowest point in the past nine years, according to FactSet. The biggest move came when sterling swung down by as much as 11% the day after Britain's June vote to leave the European Union.

Today, more than 70% of currency trading is conducted electronically and about a quarter or more is handled by automated, high-frequency trading firms, according to market-research firm Tabb Group.

"Events like what we've just seen for sterling are supposed to be extremely rare, particu-

larly in the foreign-exchange market," said Athanasios Vamvakidis, foreign-exchange strategist at Bank of America Merrill Lynch. "But the truth is that such events keep happening."

There have been a number of unexpected plunges in different financial markets around the world in recent years. The Dow Jones Industrial Average tumbled more

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- ◆ Pound's drop costs AB.InBev \$13 billion..... B1
- ◆ The short history of 'flash' crashes..... B5

than 1,000 points in the first few minutes of trading on Aug. 24, 2015. In May 2015, German government debt staged a sharp selloff that many believed to be tied to algorithmic trading. And in the tiny cocoa-futures market in 2011, prices dropped 13% in just seconds before recovering just as fast.

Traders say the sharp movements come because algorithmic-trading programs interpret the same information at the same time, potentially during a period when there is little human buying and selling, and that means trades can go one way very fast.

Automated programs can sometimes feed off each other, with each successive price drop triggering a wave of automatic sell, or stop-loss, orders, sending the price sliding further and starting another round of selling. Stop orders are designed to limit an investor's losses.

That is what some currency-market participants said they suspect happened in the sudden slide in the pound, in which an algorithm might have triggered a rash of stop orders

"When all the algos go the same way, there's no one to take the other side of the trade," he said.

Lower trading volumes will typically magnify movements in markets. But overall liquidity in currency markets doesn't appear to have fallen much in recent years. The average daily volume traded in foreign-exchange markets declined slightly to \$5.088 trillion in 2016 from \$5.355 trillion in 2013, according to recent numbers from the Bank for International Settlements. Still, currency volumes are still way up from where they were a decade ago.

at a time of already thin trading, leading to a stream of automatic selling.

"The more you automate, the more fragile the market can be," said Kevin Rodgers, the former head of foreign exchange at Deutsche Bank AG and author of a book about technology in currencies markets.

Bank of America Merrill Lynch says the market impact of a given volume of currency trading is typically around 60% higher now than it was in 2014. Mr. Vamvakidis pinned some of this to the growing importance of algorithmic trading.

Friday's trades in the pound were exaggerated because the trades happened at a time of light trading, when Asian markets aren't fully open but after many New York traders had already left for the day. The drop happened between 7:06 p.m. and 7:09 p.m. Eastern time.

"Tokyo's just opening, Singapore hasn't opened, the liquidity that you get, that's the worst period of the day," said Steve Englander, global head of currency strategy at Citibank.

Last month, economists at the Bank for International Set-

tlements said the increased use of electronic trading platforms and proliferation of trading algorithms have likely played a large role in recent moments of stress in the fixed-income market, such as the selloff in German bonds last year.

Some analysts and traders suggested that the move may have actually been less about computers and more to do with humans. Opportunistic investors may have aimed to capitalize on thin trading to sell the pound aggressively, Sydney-based analysts at Commonwealth Bank of Australia

said in a note.

"A sudden move in a very quiet time not linked to any information is highly unlikely to be due to any algorithm," said Lyle Pakula, chief investment officer of Melbourne-based hedge fund AE Capital, which uses automated computer programs to make trading decisions. "In my opinion, the source of the run is likely due to a discretionary trader trying to push the market."

Eventually, the pound clawed back to \$1.24, dived again more modestly in London hours and settled in London at \$1.2459, down 1.5% on

the day, a large sum for currencies. Late Friday in New York, the pound was at \$1.2435 from \$1.2615 late Thursday.

More broadly, European regulators are hoping to tighten rules for algorithmic trading. Automated, high-speed trading of securities, derivatives and currencies has already drawn attention from U.S. regulators for the past several years, but there has been little rule-making around the practice itself.

—Kieran Machado, Bradley Hope, Jenny Strasburg and Christopher Whittall contributed to this article.

Flash Drop

How many dollars £1 buys



Source: Thomson Reuters
THE WALL STREET JOURNAL

WSJ

SATURDAY/SUNDAY, OCTOBER 8 - 9, 2016

Citi currency trader's 'panic' blamed for speeding pound's 'flash crash' descent

FT Dec 8, 2016

KATIE MARTIN AND CAROLINE BINHAM
LONDON

The UK investigation into October's "flash crash" in sterling has focused heavily on the Japanese trading operations of Citigroup, which fired off repeated sell orders that exacerbated the pound's fall, according to bankers and officials involved in the inquiry.

Citi's traders are not believed to have started the slide in the currency in thin Asia trading but its Tokyo desk played a key role in sending the pound to its lowest levels in 31 years, bankers and officials said. The value of the pound fell from \$1.26 to \$1.14, with a 9 per cent slide in about 40 seconds.

The Bank of England has said publicly that the October 7 crash is "set apart by the lack of a clear fundamental trigger" but its investigation of the event focused on a single incident, according to a person briefed on the probe.

People with knowledge of events at Citi that day said one of the US bank's traders placed multiple sell orders when the currency slumped in unusually fragile market conditions. One of the people said the trader "panicked".

The incident raises questions on the quality of supervision and risk management at the biggest bank in the foreign exchange business. In the wake of the crash, UK regulators have written to several banks telling them to shore up oversight of their foreign exchange desks to prevent similar shocks.

Citi said that it had "managed the situation appropriately and our systems and controls functioned throughout the period". The bank declined to say whether anyone had been disciplined or whether it had changed any of its trading practices in light of the incident.

Investigators from the BoE's Prudential Regulation Authority who probed the October 7 drop were not particularly concerned by the initial trigger, people briefed on the inquiry said. Jerky moves are not uncommon in the dead of night and sterling was on a fragile footing with support undermined by the impact of the UK's vote to leave the EU.

But people involved in the investigation said the second stage of the slide coincided with a large number of rapid-fire sell orders placed in Tokyo by a Citi trader using an electronic tool known as Aggregator, which sends trade instructions into a range of trading venues. A trader at another bank said at the time that was when "all hell broke loose" with the pound.

For a short time, orders to sell sterling

were greeted with zero buying interest on the other side – a highly unusual event – due to abnormally poor liquidity and entrenched bearishness about the pound in the wake of the Brexit vote.

Nonetheless, the sell instructions from Citi's desk in Tokyo kept coming and started tripping over each other in a pattern known as "looping" that is normally constrained by safety nets embedded in bank trading tools.

Citi declined to comment on whether those safety nets, which are part of the Aggregator programme, were operating at the time of the flash crash for its own traders.

Citi was not the only trading desk selling at that point, and the bank was not seeking to make a profit, multiple people briefed on the events said. Rather, they said, the trader panicked, jamming through enough trades to magnify the slide.

A Citi spokeswoman said the drop in sterling followed "a news event" at an "extremely illiquid" time of day, a reference to a Financial Times report that night that President François Hollande of France had said he would seek a tough line on Britain's departure from the EU.

The BoE, however, said in its semi-annual financial stability report that the FT news story "was not the initial trigger".

Human error and the use of a "poorly calibrated execution algorithm" were among the possible reasons for the sell-off, the BoE said, without naming any particular bank or banks.

"It is hard to definitively rule out these possibilities as not all activity in the foreign exchange market is observable," the BoE concluded.

The BoE declined to comment on the role played by Citi or any other bank in the incident.

Typically, it is close to impossible for a small handful of trades to move a cur-

rency by such a large degree, because there is usually a wide range of buyers and sellers at any time. But on October 7, the BoE noted that during the worst point of the fall in sterling, "there was a drop-off in participation on key trading systems, which points to a potentially greater role for the idiosyncratic actions of individual market participants".

The BoE suggested the selling was too aggressive for market conditions at the time, noting that the flows "may have occurred without regard to underlying market conditions or [the] likely price impact of trading".

UK regulators are keen for banks to learn lessons from what went wrong on the night of the flash crash.

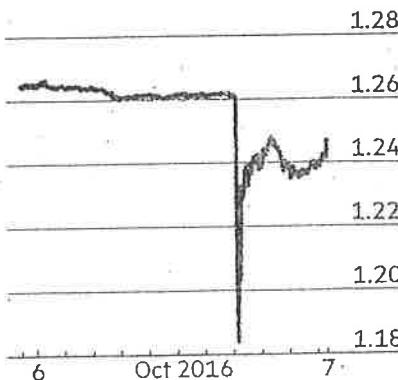
The Financial Conduct Authority, which regulates markets, and the PRA declined to comment, but people privy to their work say they have since jointly written to a clutch of the market's biggest dealing banks, telling them to ensure they are vigilant on the risk of market dislocations at illiquid times of day and that electronic trading tools are equipped with proper safety features.

The Bank for International Settlements, which monitors global money flows, is working on its own detailed report on the crash, with input from the BoE, to be released in January.

Additional reporting by Chris Giles and Leo Lewis

Sterling

Against the dollar (\$ per £)



Source: Bloomberg

The Short History Of 'Flash' Crashes

BY MAX COLCHESTER
AND ALISTAIR MACDONALD

WORLD MARKETS
The British pound sank against the dollar in volatile early trading on Friday. Market watchers said the sudden drop may have been caused by

a so-called fat-finger trade or may have been the result of accelerated computerized trades amid concerns over the U.K.'s coming exit from the European Union.

Financial markets are no strangers to sudden movements and extreme volatility that at first seem unexplained. Here are a few recent sharp examples, ranging from currencies to commodities.

July 2016

The dollar suddenly sank 1% against the yen in early Asia trading. That was blamed on a fat-finger trade that had caused stop-loss orders to kick in amid the thin liquidity of early trading hours.

June 2016

The British pound soared more than 1% against the U.S. dollar in Asian trading, due to a suspected trader error. The sudden drop pointed to investors' nerves ahead of that month's U.K. referendum on its EU membership.

May 2016

The yuan embarked on a mini flash crash following the release of Federal Reserve minutes that signaled coming interest-rate increases. The Chinese currency momentarily traded at its weakest level since February.

August 2015

The Dow Jones Industrial Average tumbled more than 1000 points in the first few minutes of trading on Aug. 24, 2015, in part as early losses triggered stop-loss orders.

May 2015

German government debt staged a sudden and sharp selloff before recovering, unnerving investors because so-called bunds are widely viewed as ultrasafe and no one could pinpoint a single factor driving the move. The Bank for International Settlements said trading algorithms may have played a role.

March 2015

The dollar slid 3% in the space of four minutes against the euro before quickly recovering. The wild ride came after the Fed hinted that it wasn't going to raise short-term interest rates as expected.

October 2014

The yield on the 10-year Treasury note took a sharp dive below 2% within minutes, confusing investors. U.S. officials later cited broad changes in the structure of Treasury markets for the sudden move, including the growing role of high-speed trading.

April 2012

Traders mainly blamed a fat finger for a sudden \$1.24 billion sale of gold futures that slashed gold prices by \$15.

May 2011

Traders blamed automation for an 8.6% fall in U.S. oil futures, the biggest single-day price decline in more than two years. An initial bout of selling on the back of disappointing weekly U.S. jobs data and a stronger dollar became a rout as the falls triggered automated sell orders.

March 2011

Prices in the tiny cocoa-futures market dropped 13% in just seconds on the Intercontinental Exchange Inc. before rebounding almost as quickly.

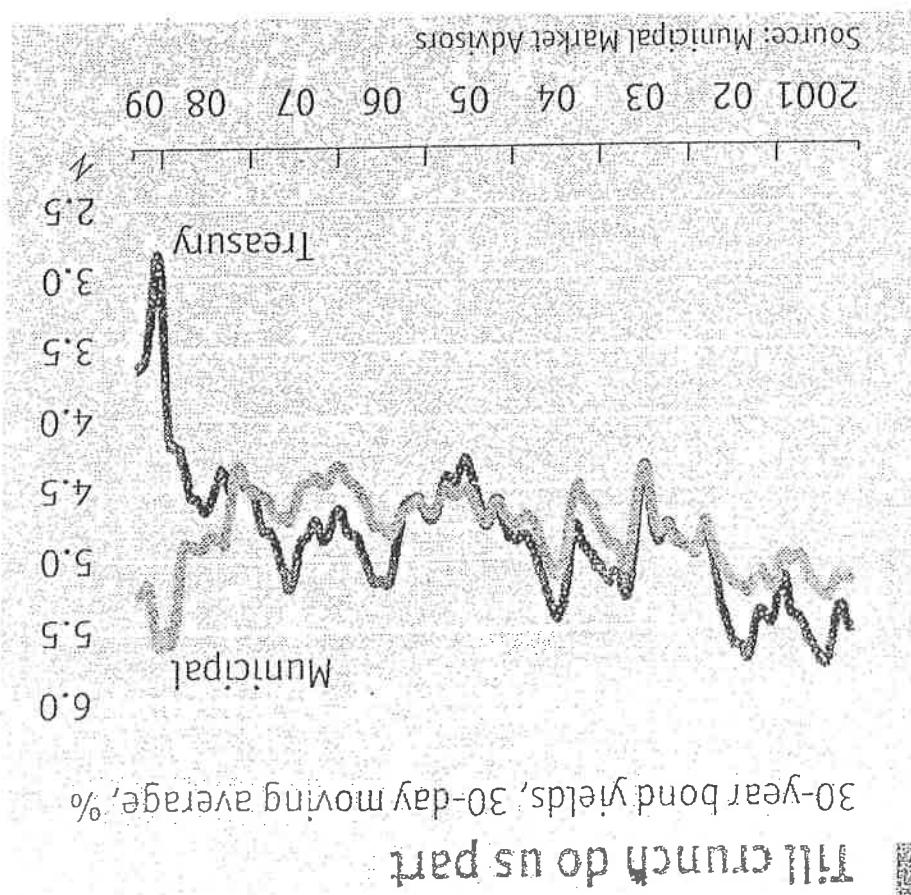
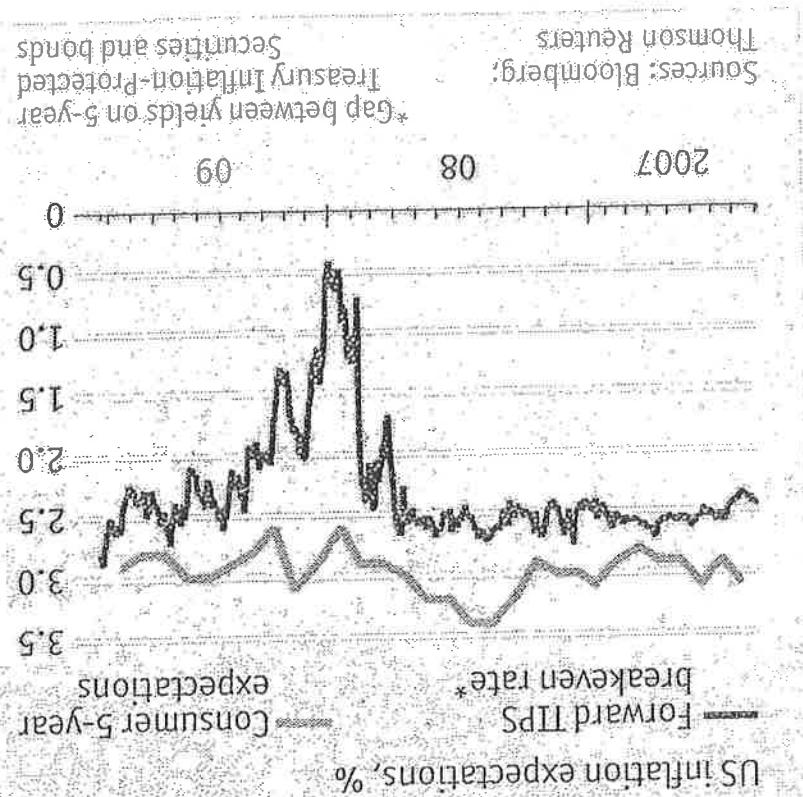
May 2010

One of the most famous examples of a flash crash happened when U.S. stocks suddenly collapsed in their biggest and most rapid drop ever, falling 9% in a matter of minutes.

May 1962

Before the era of computer-based trading, many U.S. stocks sold off at once around 2:48 p.m. on May 29, 1962, with blue chips such as International Business Machines Corp. falling sharply without notice.

The suddenness of the sell-off looked a lot like the immediate moves of the modern era, and many trades were executed at vastly different prices than they had been trading at just instances earlier. The event, which followed a period of very big gains for the market, stepped up pressure on regulators to deal with procedures for trading.



Goldman's Massive Bond Sale Goes Well

Government-Backed Debt Like 'Synthetic Treasury Bonds'; Other Financials Expected to Follow

BY LIZ RAPPAPORT
AND KELLIE GERESSY

Banks, brokers and other financial firms are poised to issue tens and possibly hundreds of billions of dollars in debt backed by the U.S. government, following the lead of **Goldman Sachs Group Inc.**, which received

strong interest from investors Monday for \$2 billion to \$3 billion in bonds it is issuing under a government program.

The Goldman bond offering is expected to be completed Tuesday and is the first major sale in the plan, which was designed to bolster financial firms by letting them borrow easily and cheaply by giving their debt a U.S. guarantee.

Citigroup Inc., General Electric Co. and other companies have signed up to sell bonds under the plan, which could help them resume lending to consumers and businesses and allow them to rebuild capital.

For investors, the bonds offer a free lunch—they are backed by the government, just like Treasurys, but pay higher interest rates. The Goldman bonds, which mature in three years, are likely to yield about two percentage points more than three-year Treasury bonds, or around 3.5%. Goldman's outstanding debt trades at yields of 7% or higher.

"In effect Goldman is issuing synthetic Treasury bonds, at a much higher yield than straight Treasury bonds" says Tad Rivelle,

chief investment officer at Metropolitan West Asset Management, which manages \$26 billion in fixed-income assets. The firm is interested in buying the bonds, which credit-ratings firms have blessed with triple-A ratings.

The bonds are being offered via the Temporary Liquidity Guarantee program, created Oct. 14 as one of the government's efforts to bolster the financial system. The plan allows many types of financial institutions to issue debt over the next six months that matures by June 30, 2012.

The bonds will be backed by the Federal Deposit Insurance Corp. This effort is separate from the plan in which the government injected capital into banks and from Sunday's bailout of Citigroup.

Details of the program, which is one of numerous steps taken by the government in the past two months to shore up the credit markets and stimulate lending, were finalized late last week. Responding to banks' urging, the Treasury department agreed to guarantee the bonds, backing them with the "full faith and credit" of the U.S. government.

Barclays Capital fixed-income analyst Rajiv Setia estimates financial institutions may use the program to issue \$250 billion to \$350 billion of debt. That could help financial institutions make a dent in the \$233 billion of debt they have to repay or refinance over the next five quarters, according to Standard & Poor's. Goldman Sachs alone has \$13 billion of debt due by the end of 2009.

A big part of financial firms' profits are driven by the difference between what they pay to borrow and how much they can charge to lend. Allowing them to borrow at low rates will boost profitability, allowing financial firms to rebuild strength in the next several years.

The expected wave of FDIC insured bank debt issuance could pressure the market for so-called agency debt, issued by government-sponsored entities Fannie Mae and Freddie Mac. This debt has more ambiguous guarantees of repayment by the government.

Meanwhile, Treasurys suffered selling Monday due to the stock rally and weak demand from a record \$36 billion two-year note auction.

THE WALL STREET JOURNAL.

C2 Tuesday, November 25, 2008

FINANCIAL TIMES WEDNESDAY NOVEMBER 26 2008

Goldman first to issue FDIC debt

Bank raises \$5bn under US scheme

Rivals line up with similar deals

By Nicole Bullock
in New York

Goldman Sachs yesterday became the first US bank to issue debt backed by the Federal Deposit Insurance Corp under one of several government plans designed to bolster financial compa-

nies and stimulate lending.

Fellow US banks were quick to follow Goldman in what could be a \$300bn or more market, bankers said. JP Morgan and Morgan Stanley were among those lining up with similar debt sales. A flourishing market for such debt already exists in Europe after deals from UK banks such as Lloyds TSB, Royal Bank of Scotland and Barclays.

Goldman sold \$5bn, significantly more than originally expected, with a yield of 3.367 per cent, or a spread of 200 basis points over comparable Treasurys for debt that has the backing of the US government and matures in June 2012. The spread on the bonds tightened to 185bps in trading.

The FDIC-backed bonds are being issued under the temporary liquidity guarantee programme, one of many federal schemes meant to revive the financial system. At issue now is whether the cash the government is pumping into the banking system will filter through to the broader economy.

"Once banks raise that money, what do they do with it? Will it spur new lending?" asked Jay Mueller, senior portfolio manager at Wells Capital Management.

The FDIC backing allows banks access to cheap funding as they face about \$386bn in debt maturing through the end of 2010, according to Standard & Poor's. Sky-high yields and widespread nervousness about the financial health of

even the largest of US banks have shut down the credit markets.

"Without the government guarantee, \$5bn of three year money would come at a massively higher yield," said Rob Kay, head of the investment-grade syndicate desk at Credit Suisse.

Spreads on corporate debt, and bank debt in particular, have soared to record levels. Existing Goldman debt was quoted yesterday with a spread of 750bps over Treasuries, or a yield of 9 per cent.

Banks are selling the new debt to investors who typically buy obligations of the government-sponsored enterprises Fannie Mae and Freddie Mac.

That has raised questions about the relative appetite for GSE debt, which carries a slightly weaker government guarantee.

Also yesterday, the Federal Reserve said it would buy up to \$100bn of debt from Fannie and Freddie and the Federal Home Loan Banks. Those risk premiums

tightened 20 to 40 bps. A three-year Fannie Mae bond now trades at a spread of 160bps. It will also buy up to \$500bn of agency mortgage bonds.

Jason Brady, portfolio manager at Thornburg Investment Management, said: "What the government didn't want was Goldman and the banks to benefit from cheap funding at the expense of the mortgage borrowers."

Additional reporting by Anousha Sakoui in London

Deutsche Trading Hit: \$1 Billion

By SCOTT PATTERSON
AND GREGORY ZUCKERMAN

One of Wall Street's best-regarded young traders sustained a \$1 billion hit recently, as the corporate-bond-trading market has been upended by the credit crisis.

A Deutsche Bank AG team led by 35-year-old Boaz Weinstein had for months been using a "basis trade" that involved buying large amounts of corporate bonds, and at the same time hedging those bets by buying credit-default swaps, in essence insurance against a default on those bonds. Profits flowed, as the corporate bonds carried yields that were slightly higher than the cost of buying swaps protection.

But in recent months, amid the credit-market upheaval, investors have fled from many corporate bonds. And because they

are less liquid than credit-default swaps, or harder to trade, Deutsche's corporate-bond positions have dropped more in value than their CDS hedges gained, leading to the losses.



Boaz Weinstein

"I don't think there's anybody around who expected the CDS-cash basis to widen out this much this fast," said Brian Yelvington, senior macrostrategist at research group CreditSights.

A recent move by Deutsche to reduce borrowed money in its trading area also has added to the losses, by forcing traders to sell while the corporate-bond market has fallen, according to a person familiar with the bank. Mr. Weinstein's team was involved in other trading as well, including convertible bonds. Mr. Weinstein didn't respond to a request for comment.

The losses represent a setback for what has been one of the more successful credit-trading desks on Wall Street in recent years. In November, Deutsche had said it planned to lay off 900 people, including employees in its structured-products and proprietary-trading desks. Other banks such as Morgan Stanley have said they are scaling back risk-taking businesses, too.

The risk premium on highly rated corporate bonds has doubled since early September to historic highs of 6.5 percentage points over comparable Treasury bonds, according to Merrill Lynch & Co.

Some market observers think the losses in the basis trades are likely to shrink when credit markets stabilize. Tim Backshall, a strategist at Credit Derivatives Research in Walnut Creek, Calif., said he has been telling clients that the trades represent an opportunity.

Though the German bank has recorded gains in other trading

Continued from the prior page
areas this year, recent troubles in the corporate-bond market have made it more difficult for Deutsche to dig out from the losses, according to a person familiar with the matter. The news of losses was previously reported by Bloomberg News.

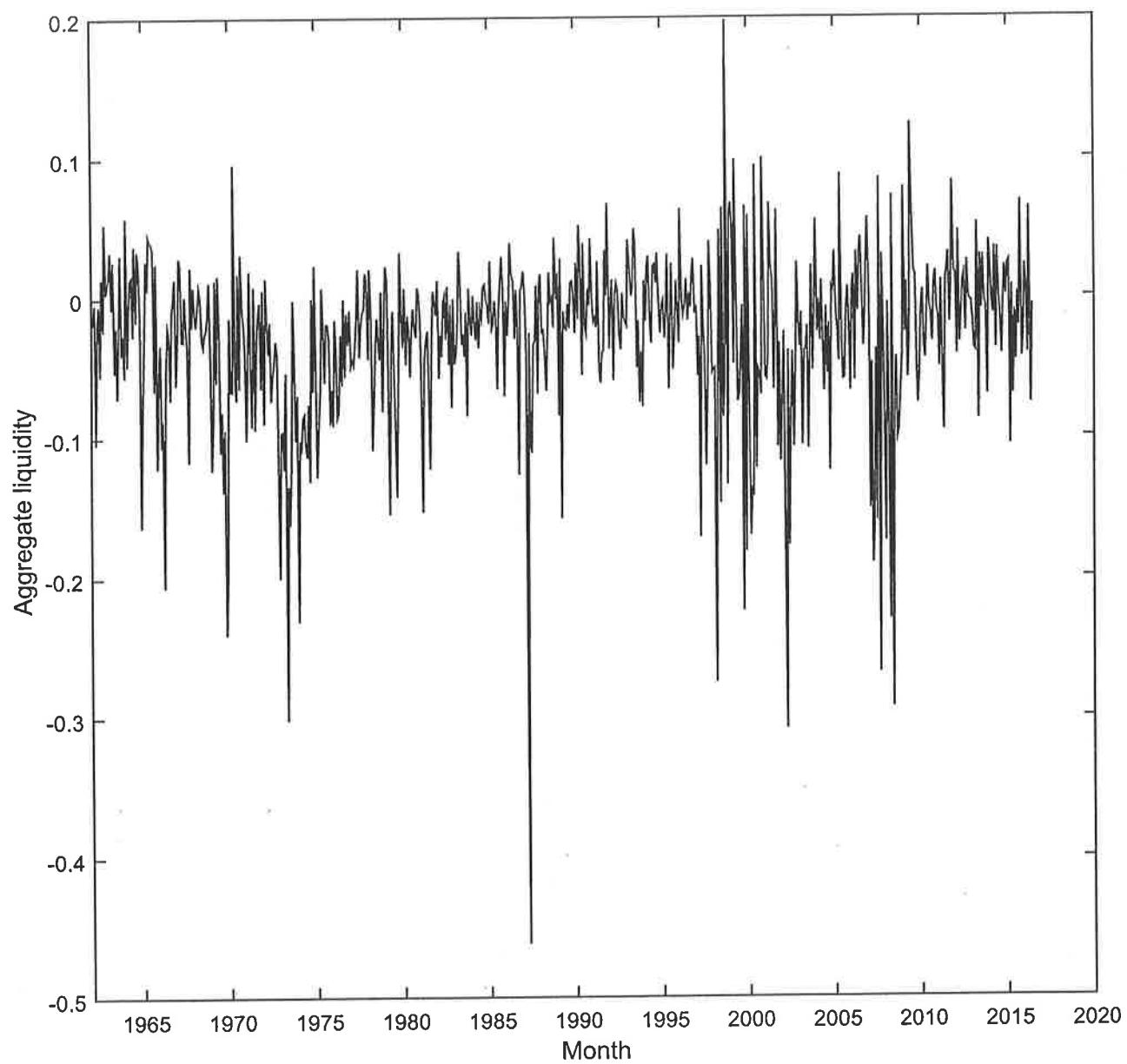
The trades that hurt Deutsche are similar to ones that led to losses at Chicago hedge fund Citadel Investment Group LLC, which was down almost 50% this year in its two largest funds through early December. Losses on the trades for Citadel have slowed in December, said a person familiar with the matter.

Mr. Weinstein joined Deutsche in 1998 to trade credit derivatives and soon started trading credit-default swaps, which were relatively new at the time.

His skill at trading the instruments, and in discovering hidden pockets of value in the market, put Mr. Weinstein on the fast track at Deutsche. He was an innovator of a strategy known as capital-structure arbitrage, which exploits discrepancies between the price of a company's bond and its stock, and often uses credit-default swaps.

As the CDS market expanded into one of the largest in the world, so did Mr. Weinstein's cachet at the bank. In February 2008, he was appointed co-head of global credit trading at Deutsche along with Colin Fan.

—Liz Rappaport contributed to this article.



Pastor and Stambaugh (2003), updated through Dec 2016.

Investing

STRATEGIES

MARK HULBERT

At Least One Kind of Shock Is Good for Some Stocks

PREDICT that within a few years, Morningstar, the mutual fund rating service, will face a typesetting challenge. I base my forecast on a new study that, if it becomes as widely accepted as I believe it will be, may persuade Morningstar to add a third dimension to its famous "style box," transforming it into a "style cube."

Morningstar's style box, which looks like an enclosed tick-tack-toe grid, is used to classify equity mutual funds along two axes — market capitalization (small, medium or large) and valuation (value, blend and growth). It is based on research assessing the performance of stocks according to where they fall along these two dimensions, which are referred to as styles.

The new study, however, by Lubos Pastor of the University of Chicago and Robert Stambaugh of the Wharton School of the University of Pennsylvania, has discovered the basis for a new investing style that may be just as important as the current two. Note carefully, however, that you should not criticize Morningstar for not yet incorporating the discovery. Only in mid-July did this study even begin circulating among academics (<http://finance.wharton.upenn.edu/~stambaugh/liquidity.pdf>).

The study focused on the stock market's overall liquidity. That focus might seem odd, because liquidity is usually defined at the level of individual stocks, generally referring to the ability to trade large quantities of that stock quickly, at low cost, without moving its price. But Professor Pastor and Professor Stambaugh were able to demonstrate that certain stocks were much more sensitive than others to changes in the market's overall liquidity.

The phenomenon is well illustrated by what happens during so-called liquidity shocks — events like the 1987 market crash or the 1998 tumble of Long Term Capital Management. Liquidity shrinks sharply during these events, and not just for individual companies but for the market as a whole. In the wake of liquidity shocks, some stocks plummet while others barely budge.

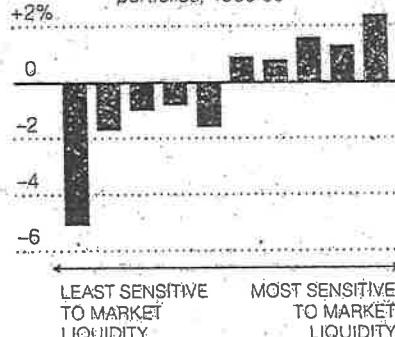
It turns out that, over the long term, the stocks that are most vulnerable to liquidity shocks outperform those that are least vulnerable to them. From the beginning of 1966 to the end of 1999, the professors found, the most vulnerable stocks outperformed the most immune ones by an annual average of 7.5 percent. Moreover, this performance difference could not be shown in Morningstar's existing style box; it held up regardless of whether a stock was small or large cap, growth or value.

Economics 101 helps us to understand this liquidity-related style: To induce investors

A New Trading Dimension

Stocks that are most sensitive to changes in the stock market's overall liquidity tend to have higher returns over time, according to a recent study.

Variation in average annual return from overall stock market for 10 different portfolios, 1966-99



Sources: Lubos Pastor and Robert Stambaugh, "Liquidity Risk and Expected Stock Returns."

The New York Times

to own stocks that plummet during liquidity shocks, they must be rewarded with higher long-term returns. Otherwise, they would prefer stocks that are less vulnerable.

Though the two professors found that no single historical characteristic was a per-

fect predictor of how a stock would react to liquidity shocks, one of the useful indicators was how it reacts to large "buy" or "sell" orders. They found that if a stock tended to reverse direction the day after such orders then more often than not it was sensitive to liquidity shocks. In contrast, a stock was relatively immune to liquidity shocks if it was less subject to such daily reversals.

But be careful not to confuse a stock's vulnerability to liquidity shocks with its volatility — a measure of the fluctuation in its price. Such vulnerability is but one of many causes of volatility. In fact, many stocks are relatively immune to liquidity shocks but nonetheless quite volatile.

We can hope that over the next several years, Wall Street's research departments will start reporting stocks' sensitivity to liquidity shocks. If such data is made widely available, individual investors will be able to increase their long-term returns simply by filling their portfolios with the stocks that are most sensitive. But even if liquidity data is not so widely disseminated, the study shows clearly that Wall Street professionals need to add this variable to their analytical models.

As usual, however, there is no free lunch. Without a willingness to hold such stocks through liquidity shocks, during which there will be huge short-term casualties, investors will not be able to realize the stocks' long-term potential.

Mark Hulbert is editor of *The Hulbert Financial Digest*, a newsletter based in Annandale, Va. His column on investment strategies appears every other week. E-mail: strategy@nytimes.com.

SUNDAY MONEY

STRATEGIES

MARK HULBERT

This Pendulum Has a Past

In bull markets, it's wise to guard against thinking that "this time is different" — that stocks will keep rising forever. Sooner or later, the laws of economics reassert themselves. And it's wise to remember that major market declines follow some common patterns, too.

Right now, it's tempting to think that this bear market is so unusual that history's lessons are of little use, and that the types of investments that are weakest now will keep dropping indefinitely. No two market environments are identical, of course, but there is plenty of precedent for the credit crisis of the last 18 months — and for its profound effects on the stock and bond markets.

In fact, you can view the markets' behavior since mid-2007 as a textbook illustration of a statistical pattern uncovered years ago by two finance professors, Lubos Pastor of the University of Chicago and Robert F. Stambaugh of the Wharton School of the University of Pennsylvania. They found that the financial markets are always vulnerable to what they called a liquidity shock — a sudden tightening of credit. Aside from the current crisis, two recent examples are the market conditions during the market crash of October 1987 and the wake of the near-collapse of Long-Term Capital Management in the fall of 1998.

Some types of securities — high-yield, or junk, bonds, for example — are usually more vulnerable than others in such an event. The most immune from liquidity problems are those for which there is always robust demand, so they can be sold anytime without pushing down their prices. As has become abundantly clear over the last 18 months, Treasury securities are a good illustration. At the other extreme are those securities that, without an abundant supply of available credit, become difficult if not impossible to sell at any price.

The professors' research was the focus of this column in August 2001, and their study appeared in the June 2003 issue of *The Journal of Political Economy*. According to Google Scholar, no fewer than 623 academic articles and studies now cite their study.

This research provides a good template for understanding the last 18 months, according to Lasse Pedersen, a finance professor at New York University who has conducted a half-dozen studies in recent years into the market's reaction to liquidity crises.

Mark Hulbert is editor of The Hulbert Financial Digest, a service of MarketWatch. E-mail: strategy@nytimes.com.

In the current crisis, Professor Pedersen said in an e-mail message, "securities with high liquidity risk have done very poorly," just as we should have expected. A good example is convertible bonds, which previous research found to be particularly vulnerable to liquidity shock.

"They have gotten killed," he wrote.

Though the large body of research into liquidity shocks may offer little comfort to investors who've lost so much in the last 18 months, it is an antidote to the argument that history has nothing to teach about the current crisis. The research has found that when liquidity shocks occur, they are so intense that the securities most vulnerable to them predictably provide higher longer-term returns. This happens, Professor Pastor said in an interview, because these securities must compensate investors for the risk of big losses during those shocks.

This doesn't mean that anyone can predict such shocks with certainty. Instead, according to Professor Pastor, there is a small but significant risk that one could happen at any time — and that investors are deluding themselves if they don't take that risk into account.

Investors who despair that this credit crisis may never end may therefore be guilty of the mirror opposite of a mistake made earlier in this decade, when liquidity was plentiful. Just as many investors forgot several years ago that another liquidity crisis was destined to happen someday, many may now be forgetting that liquidity shocks don't last forever.

WHICH securities will perform best after the current credit crisis, and which will fare worst?

According to the research, once a liquidity crisis passes, other factors come to the fore, and securities that have risen in price, like Treasury bonds, are then likely to perform poorly. By contrast, the best performers will be those securities that have lost the most during past credit crises — not just during the current one. Convertible bonds and junk bonds are two obvious categories that should do particularly well, but others, including stocks, should also benefit.

If you can tolerate short-term volatility, you should consider such securities for the long term, Professor Pastor said, even if you're worried that the credit crisis has longer to run. That's because it is impossible to predict the exact end of the bear market, and because these investments should provide high-enough returns over the long term to make the risk worth taking. □