Julia: Hello and welcome to a DerivSource podcast. I'm Julia Schieffer, the founder and editor of DerivSource.com

The spotlight on derivatives is often shone on the clearing side but legislation such as the CFTC's Risk Controls and System Safeguards for Automated Trading and ESMA's guidelines on automated trading is increasing the focus on pre-trade risk controls, post-trade measures, system safeguards and other protections for both market participants and trading platforms.

With us in this podcast we have Sanjay Shah, CTO of NanoSpeed talks to us in this DerivSource podcast about how these regulations are re-shaping the industry and the role that connectivity solutions have to play.

Here is DerivSource reporter, Lynn Strongin Dodds speaking to Sanjay Shah.

Lynn: **Hi, this is Lynn Strongin Dodds. We are talking to Sanjay Shah, CTO of NanoSpeed. Thank you very much for taking part in our podcast.**

Sanjay: Hi Lynn. Thanks very much for inviting me to this, and hello everyone.

Lynn: **This is part of a series we are doing on Risk for derivatives. So the first question is really a broad one, what are the main pre-trade risks for derivatives?**

Sanjay: The main pre-trade risks and checks that are performed in derivatives trading are, for example, things like per instrument and buy / sell restrictions, price limit checks, so this would be percentage away from the last traded price, for example + 20%, - 15%, order quantity limit, for example trading particular derivatives, particular options, and you might have a limit of say 100,000 of those options per order, so that would be one of those things.

Then there would be other things like notional value limits of some form for consideration, which is basically price times quantity. Then there would be something called average daily volume checks for futures and options. And then there would be also some type specific restrictions like the number of orders per second or number of orders every three seconds.

Those are the main pre-trade risk checks.

Lynn: **Thank you. What impact is regulation, most notably the guidelines set by CFTC, so risk control and systems safeguard for automated trading in the US, and in Europe ESMA's guideline on automatic trading; what impact is that having on the derivatives industry?**

Sanjay: All the derivatives prop desks are taking these guidelines very seriously because they will become regulation soon, probably. The reason I say probably is because, for example, the concept relief (by CFTC), that has received a lot of comments. They put it out for comment and over the last year and a half there have been comments coming from people for that. Now CFTC are considering what to do next, and this is as of the beginning of this month.

What will probably happen, like with other regulations that the CFTC has brought out, is that during the course of the next 6 months, a year, they will start to actually introduce this as a regulation. So, not just a guideline, but it will then become something that people will have to follow.

So prop desks are taking this very seriously at the moment and these particular guidelines, they are broadly based on some of the things that I said, like for example the price limit checks, order checks, limit checks, notional value checks, those sort of things. So it is very important for prospects who are trading derivatives to be taking this seriously at the moment.

Lynn: **High frequency is often talked about in terms of equities. Is it an issue (high frequency trading) for derivatives traders, and if so why, and how?**

Sanjay: Yes, high frequency trading is quite a common thing that a lot of derivatives traders are doing, so these would be basically something which is over 100,000 shares that they might be trading every second or so, that would be classed as high frequency. The total levels that we are talking about is quite a lot of traders who would be classed as high frequency traders.

That's not to say that high frequency trading is a bad thing to do; it's a very common practice and when it's done properly in a regulated market then it has a good impact on the market - you have large volumes ,and it is generally a good thing.

Lynn: **What type of pre-trade risk checks need to be in place, and is this for every order that is sent?**

Sanjay: Yes. Actually, these sort of risks that I mentioned, that would be for every order that is sent, so for example per instrument buy or sell limits. If a particular instrument is traded and there is a limit set on that, then that would be being checked on every order that that particular instrument is being traded on.

Lynn: **Why is your ultra-fast field programmable gate array, or what is known in the industry as FPGA connectivity solutions, relevant to derivatives traders?**

Sanjay: These risk checks are commonly done in software at the moment, and they have quite a large latency impact on the system, and the worst thing is that sometimes the latency impact is undefined; for one particular order it might be 100 microseconds; for another order that risk check might take 200 microseconds, so there is a little bit of uncertainty there.

With the FPGA solutions it actually tackles both of those issues. Firstly, FPGAs are very good at processing everything in a parallel way, so whereas with software a lot of these risk checks might be say, 20 risk checks they might be doing these risk checks in a serial pattern, one after another. In an FPGA, all 20 of those risk checks will be started in parallel and pretty much finished in parallel as well.

The other thing is that the uncertainty, or *jitter* as they call it in the industry, is avoided in the FPGAs because there isn't an overhead of an operating system, for example a Windows or Linux operating system like you would have with a software solution.

If a particular risk check takes for example 100 nanoseconds, then it will always take 100 nanoseconds; it won't take 110 nanoseconds, it definitely won't take microseconds to do that. So the jitter aspect is completely tackled or avoided by FPGA solution.

Lynn: **There is a perception that FPGA technology is unreliable. What have been the problems in the past, and how does your product differ?**

Sanjay: There have been some issues of unreliability with FPGA systems, with some FPGA systems. Now FPGA systems traditionally have been able to do things in a fairly simple way.

If you have quite a complex problem with a lot of different parameters, then FPGAs are sometimes not very good at handling that, but that was the case a few years ago. Now FPGA technology is mature and it's actually… The FPGAs themselves are getting bigger and bigger, for example the largest FPGA on the market fairly soon now, not today, is available in engineering systems, is an FPGA called Stratix 10 by Altera, and that one has 10 billion transistors in it, which is about double the number of transistors that you have in the largest Intel Xeon processors.

So they are becoming big, they are able to solve fairly complex tasks now, and what we have found is that there have been reliability issues but there are some companies, including NanoSpeed, that have background in, say, the aerospace industry or the space

industry, or some other industry that have reliability as their centre of all their design developments, their testing. So, it is very important to hack into the reliability issue, and a lot of companies, including NanoSpeed, are tackling that by having the aerospace background.

Lynn: **Who do you see as your main competition?**

Sanjay: There are quite a few companies, vendors, who have brought out some solutions in the pre-trade risk check area, there are some which are based in the US, some in Europe, there are one or two cropping up in Asia as well.

At the moment, we don't actually see that there is a huge amount of competition. There are only a handful of vendors actually doing this. There are a lot of banks and operating companies who try to do this in-house, but it's difficult to find the FPGA expertise who are able to do this in-house.

FPGA expertise is slightly, subtly different from the software expertise; you can't get software engineers to use FPGA, so it is a field that requires slightly different thinking to the traditional software engineering field, but we're finding that there is enough slice of the cake for everyone.

Lynn: **Looking ahead, will that still be the case? In general, how do you see the industry developing?**

Sanjay: I think the FPGA side of things for doing pre-trade risk checks is very, very good because of the parallelisms involved in the FPGAs and the lack of jitter, or avoidance of jitter. The other term that a lot of people use is determinism. It gives a deterministic performance, and for those reasons FPGA based solutions for pre-trade risk checks are here to stay, in my opinion.

With the FPGAs becoming more and more mainstream, I think it's possible that FPGA based solutions will be more and more prevalent in the industry going forward.

Lynn: **In your own business, looking ahead, what are your greatest challenges, as well as the opportunities?**

Sanjay: I think challenges are always the new regulations that come out in the industry, and I think it's a good thing that the industry becomes more and more regulated, and to keep up with those regulations. So that's sometimes a bit of a challenge. You've obviously got the CFTC and ESMA that we mentioned, and also MiFID II is coming very soon in Europe, so that has its own challenges for the FPGA industry and the trading industry in general. I think there are a lot of challenges based on the regulations.

In terms of opportunities, as I mentioned, FPGA technology is becoming a lot more mainstream, it's becoming more usable. Very complex FPGAs are possible, so you can actually have fairly complex solutions akin to software-type solutions that we can implement on the FPGAs, and Nanospeed are doing a lot of complex things which you wouldn't have dreamt of doing on FPGAs before, these would have been done on software-based systems which would have all the flexibilities that you would not associate with FPGAs.

I think there are a lot of opportunities for FPGAs to become more like software-based, very flexible and fairly quick systems in the future.

Lynn: **Thank you very much. It's been very insightful, and again thank you for taking part.**

Sanjay: Thanks very much Lynn. Pleasure talking to you.

Julia: **Thank you for listening to this DerivSource podcast.**

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