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Speech by Vice Chairman Fischer on the transmission of exchange rate changes to output and inflation

**At the Conference on Monetary Policy Implementation and Transmission in the Post-Crisis Period, Washington D.C.
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[Applause]

VICE CHAIRMAN FISCHER. Thanks very much, and good evening. And looking at the program, I feel really sorry that meanwhile they've cooked up another program for some of us, and we go to meetings and decide about interest rates and things like that, which are much less interesting at the moment than many of these papers. I want to talk about something which is straightforward and simple, but I do want to explain how we get to the numbers that we use on the impact of the exchange rate on both output and inflation. Now, I think for a long time, the exchange rate didn't seem to matter very much for the United States except when it go way out of whack. And that contrasts very much with what happens to people who live in small open economies, which is what I did for eight years as governor of the Bank of Israel. And, in that situation, my screen was open continually at the exchange rate, and there were-- I was much less interested in the interest rate than in the exchange rate. Now, these are problem for all small open economies, and as you know, many small open economies that weren't small by the standards of what I was doing, but they're small relative to what I'm doing now. Like Canada used a monetary conditions index which was a combination of the exchange rate, changes in the exchange rate and changes in the interest rate from a given base. And if you look at those, those estimates of different countries, you see that the equivalent of the 1 percentage point change in the interest rate in terms of how much change in the exchange rate you need to be equal to the impact on the index of 1 percent on the interest rate. That goes up with the size of the economy.

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So, in the case of the-- of the Eurozone, it takes a 6 percent change in the exchange rate to equal a 1 percent change in the interest rate. In the case of Canada, in the indices they published, it took a 2 percent change in the exchange rate to equal the impact of the 1 percent interest rate change.

Now, I'm going to talk about the United States, and it's not surprising that fluctuations in the dollar have typically received much less attention here in the past than they have in other countries. But it remains true that the exchange value of the dollar plays a significant role in the U.S. economy, and it's a role that has increased over the course of time given our growing global trade and financial linkages. I think it seems like an interesting question why the U.S. economy continues to be so important in the global system. In 1946 up to 1950, U.S. accounted for 50 percent of global GDP, it's just sort of clear why an economy of that size would matter. Now it accounts for about 22 percent, 23 percent. I think the difference is that capital account linkages have become more and more important over the course of the post-World War II period, and that the capital markets of the United States remain the most important in the world. And I think it's the increasing importance of capital account that balances the decline in the importance of the size in terms of goods production of the United States economy and will that still remain the most important economy in terms of-- for good and sometimes for bad as we've seen recently. Now, as, [inaudible] one. As we see looking there, the roughly 15 percent appreciation of the dollar since July 2014 is large though not unprecedented. If you remember the Plaza agreement, you can see that was a real run up in the exchange rate and the 15 percent that we've had since 2014 is much smaller than what we've seen in the past. But it's nonetheless had an important influence on the United States economy. And what I'm going to do is just go through the arithmetic and it's purely arithmetic of what impacts that is-- that has had. Now what caused the

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rise in the dollar? Well, the U.S. economy has performed fairly well, and major foreign economies have generally performed less well, and have also had persistently low inflation as we have. Because the foreign central banks responded appropriately to their weakness by providing additional monetary accommodations, foreign interest rates have declined relative to U.S. interest rates which caused foreign investors and American investors to shift into the dollar denominated assets and boost the dollar. But that's only one part of why the dollar ascended. The second factor as being the heightened concern about the global outlook, and then associated a decrease in investor risk tolerance which are factors that tend to increase investment in dollar assets. And in recent months, investors have been particularly focused on the possibility of a slowdown in China, and other emerging market economies with commodity exporters seen as particularly vulnerable in the wake of the dramatic drop in oil and non-oil commodity prices since the summer of 2014. So now, what I want to do is to look at the effect of the stronger dollar on U.S. activity and inflation. And it will be convenient for illustrative purposes to focus on the effects of a 10 percent appreciation that is assumed to be permanent, and then draw in it to calculate how much influence a 15 percent appreciation would have on the economy.

Now, the main way in which the stronger dollar affects you as output is through exports. And so I'll begin by focusing on the impact of the exchange rate on U.S. exports. Now, clearly, an increase-- an appreciation of the currency leads to a lower-- to lower exports. And what we have in figure two, in the blue line there, is the response of U.S. real exports to a 10 percent dollar appreciation. This is derived from a large econometric model of U.S. trade which the Fed staff maintains and it's called the USIT model. It sounds like in the sense of use it or lose it, but actually it means U.S. international transactions model. And this is by the staff. There's going to be an article in our international finance discussion papers, IFDP notes series in of-- within a few

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months and that will provide details on the structure and the estimation of the trade block of the USIT model that I'll be using.

Now, what that model says is that, real exports decline by about 3 percent after a year, after a year, and more than 7 percent after three years. The base for that is exports amount to about 13 and a half percent of United States' GDP. So, after 3-- after a year, you've got an impact of about 0.4 percent of GDP on the level of exports. And after three years, you've got an impact of about 0.9 percent of GDP on exports. That's the blue line. So that's the amount of direct losses to the economy through export-- through exports. Now when you turn to imports, I have first to explain, which I didn't explain in the chart, that the 2 percent positive on the vertical axis is different than the 2 percent negative is quantitatively different than the 2 percent negative on the vertical axis because the import number is a percentage of imports which are larger than exports. So that the 4 percent decline in the imports has a greater impact than more than 4 percent decline in exports on the economy. I'll come to those numbers in a while. And the important part of what is seen there is that there is a-- an extensive literature which is found that the degree of pass through of exchange rate changes to U.S. import prices is low as foreign exporters prefer to keep the dollar price of the goods they sell in the U.S. market relatively constant. And there's a paper by Gita Gopinath that many of you have probably seen which makes this point very clearly. A typical estimate is that an appreciation of the dollar of 10 percent, causes U.S. non-oil import prices to fall only about 3 percent after a year, and only slightly more thereafter. So the impact on prices is-- on import prices is quite low. This is effective. It helps account for the more modest impact of the exchange rate on exports that's shown by the red line in figure 2. And that indicates that real imports have risen by about 3 and 3/4 percent after three years or 0.62 percent of GDP. That's where that intersection with the right hand vertical axis after 12 quarters takes

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place. So we've got a loss of exports of 0.9 percent of GDP after three years and an increase in imports of 0.62 percent of GDP after three years or a change in net exports of 1-1/2 percent of GDP after three years from a 10 percent change in the exchange rate. Now, putting that together and putting the dynamics of all that together, we get the impacts of-- we get the change the reduction in US GDP through the net export channels we've just discussed. And what the two curves we showed in the previous chart showed is that the direct effects on GDP are that GDP falls slightly over 1-1/2 percent of GDP after three years, a number which we also derived from figure 2. Now, these effects take place quite slowly with over half of the adverse effects on GDP occurring after more than a year. So the pass through particularly on exports is relatively slow. Now, so that's where we are on the assumption that there is no offset due to monetary policy easing. But in our case, in the last year, there was a change in monetary policy and I'll discuss that. We need to remember, this is 1-1/2 percent for 10 percent on the exchange rate, so it's 2-1/2 percent with actually 2 and a quarter percent for a 15 percent appreciation of the exchange rate after three years. So, if there were no offsetting monetary or fiscal policy actions, we get a decline of 2-1/2 percent of GDP after three years, and that's pretty large. It's certainly larger than what my instincts told me when I started investigating all these numbers. So how well has this done, has this model done so far in accounting for the actual behavior of U.S. real net exports? Well there are many factors that affect trade flows such as labor disputes at major ports as occurred earlier this year primarily in California. But what we get in practice is not that far off what the model says. The model says that after a year, GDP is down by about 1 percent and the data are that by our accounts just calculating from the actual behavior of net exports, the GDP fell by three quarters of a percent. So, there's a substantial direct impact on GDP, particularly since we're talking about what happened within the course of just a year on growth. Looking

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ahead, if we assume we're talking about something that began at the-- in the-- towards the end of 2014, we still got some more of that impact to come in the fourth quarter when we get the last reading on the impact of this appreciation on the U.S. economy. And then of course we'll have significantly more in the next two years and everybody knows that the more export oriented manufacturing sector has already taken a big hit during the past year and that exports have grown more slowly than the broader economy. So that's the simple story and it's pretty simple, this is sort of stuff you could teach undergraduates. Turning now to inflation, it's also a relatively simple story. Consumer price inflation as we all know has been running well below the Fed's 2 percent target. And the exchange rate and appreciation of the exchange rate, the strong dollar, has played an appreciable role in the short fall. Now, it puts the main way in which the stronger dollar depresses inflation is by putting downward pressure on import prices. And, we're drawing now on an econometric model that is discussed in a recent speech by Janet Yellen, the one that she gave at Amherst about a month ago, I think, yeah. Well, nobody knows, well, I think it was a month ago. To illustrate how a 10 percent appreciation might play through to the PCE deflator which excludes the more volatile food and energy components. What we get for prices is that a 10 percent appreciation causes core PCE inflation to decline by about half a percent in the two quarters following the appreciation. That's that sharp downward movement. And then, that shock begins to wear off. By the end of the year, the dollar-- The impact on price is about 1/3 of a percentage point, so 0.3. The core inflation rate is about 1.2, 1.3, so this would account for 0.3. What happen through imports accounts for about 0.3 of a percentage point in what happened to core inflation and that helps explain somewhat why we're at 1.3 and not at 1.6, 1.7. But there is a second channel through which dollar appreciation reduces inflation, and that's by increasing economic slack, that is to say, unemployment. Greatest slack amplifies the downward pressure

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on inflation. Although given a fairly flat Phillips curve, the quantitative effect is probably fairly small. We should recognize that because the pass through of the dollar to oil and food commodity prices is much higher than for most imports, dollar appreciation tends to depress overall PCE inflation by even more than it depresses core inflation. Now, the import prices decline and then the peak effect on inflation occurs within two-quarters and we're at about down to third by the end of the first year. So, our view is that as this fades and it starts fading and it's getting close to zero by the end of the second year, we will have seen an increase in inflation because overall-- because of the decline in import prices. And as long as inflation expectations remain well anchored, we believe that both core and overall inflation are likely to rise gradually towards 2 percent over the medium term. As the labor market improves further and as the transitory effects of declines in energy and import prices dissipate. Now, in people's talking about all this, I'm impressed by how people say, well, we look through the increase in the price of oil in 2008 and we didn't raise the interest rate to deal with it and so we're going to look through the impact of the decline in the inflation rate as a result of declining the price of oil. And then they proceed to talk about the zero percent inflation. Well, you can't do both. If we're looking through the factors which cause the core rate to be 1.2 or 1.3 percent, it cause the core rate to be 1.2, 1.3 percent while the actual rate is very close to zero, we should be looking at the core rate and not the zero. But a lot of people talk about, well, we're at still at zero inflation and we're going to be stuck here forever. Actually, the impacts of energy prices feed through pretty quickly to inflation. So we're not going to be stuck here forever. And in fact, it-- well, if oil prices can't help themselves-- if oil prices can't keep going down forever, technically, they can, I suppose. They could even keep going down at a constant rate forever, I assume. If they can't, then we're not going to have this impact for very long. I was-- have the good fortune a few days

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ago to be speaking to an audience which included the son of Ben-- of Herb Stein, who is the author of the expression, "If something can't go on forever, it will stop." And his son asked me-- there were questions after that speech, as there are unfortunately not after this one, said, "Well, why is the price of the-- why is the price-- rate of inflation so low right now?" So I said - I know Ben so it was OK to tease him- I said the prices-- the inflation is very low right now because the price of oil has been declining rapidly. And Ben, something that cannot go on forever will stop. And so he appreciated that, I think. Well, let me talk about monetary policy and explain why we think there actually is a case to believe that monetary policy responded somewhat as it should have to the declining inflation that we got as a result of the appreciation of the dollar. And we do-- I can do that by looking at the famous dot plots. The projections that made in the summary of economic projections, the SEP as it's called, which tell you what the FOMC thought about inflation and growth in 2014, in the summer of 2014, and what they thought about inflation and growth a year and a quarter after that. So more numbers, I apologize. The June 2014 survey of the projections of the members of the FOMC, showed expectations of U.S. GDP growth centered at about 3 percent for 2015 and core inflation expected to be at around 1.75 percent. And in addition, median participant projected that the appropriate level of the exchange rate by the end of 2015 would be 1.25 percent before it rose to 2.5 percent by the end of 2016, that's a year and a quarter ago. Just to repeat the numbers, a core inflation rate of 1.75 percent and a projection of federal funds rate for the end of this year 1.25 percent. But then in the most recent summary of economic projections, the SEP, following the September FOMC meeting. The median participants saw GDP growth at 2 percent this year, core inflation at 1.5 percent and the federal funds rate below a half percent at the end of 2015 before rising to only 1.5 percent at the end of 2016 as opposed to 2.5 percent they had seen a year and a quarter before that. Well, this just

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means that during the course of-- at the time, that year and a quarter, the open market committee changed its mind and ended up with an interest rate that was essentially a full percentage point below where it was expected to be a year before. And in that sense, we were running an expansionary monetary policy or we had a greater degree of monetary accommodation. So, that was the change in policy and that was an appropriate change in policy. Now, the Board's staff's general equilibrium models because there's quite a few that take explicit account of the ability of monetary policy to crowd in domestic demand including the staff's FRB/US model that you all know. I think, Ben Freidman and I remember the days when it was called the MIT Penn Fed Model. And the multi-country sigma model suggests that monetary policy easing can substantially mitigate the effects of adverse shocks on GDP including from the recent run up in the dollar. So what comes out of the Fed's general equilibrium model is very close to what happened. And this means that the impact of the full-- the impact of the rise in the dollar-- the appreciation of the dollar plus the offsetting monetary policy is about a half to two-thirds as large as trade-- taking trade of that-- taking the effects-- the direct effects of only export and import reductions into account namely it substantially, significantly, modifies the impact of a negative shock on the economy. And that's what happened in the past year.

So let me wrap up. It's clear that the appreciation of the dollar and the accompanying foreign weakness has been a sizeable shock, but the U.S. economy appears to be weathering those shocks reasonably well, notwithstanding their large effect on sectors-- certain sectors of the economy heavily exposed to international trade. Monetary policy has played a key role in achieving these outcomes through deferring liftoff relative to what was expected a little over a year ago. The October 2015 FOMC statement indicated that it may be appropriate to raise the target rate for the federal target range for the federal fund's rate at our December meeting,

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although the outcome will depend on the committee's assessment of the progress realized and expected that has been made toward meeting our goals of maximum employment and price stability. But, of course, as policymakers, we have always to be vigilant for the possibility of events unfolding differently than we expect and we still got another month's plus of events to unfold. And we have to be ready to react to the actual events and not the ones we might prefer to have which I can sum up this whole talk by saying what I learned to say in the IMF when things were going well. The IMF has a problem when it surveys a country and there's not much to complain about. What do you say? So, what they say is complacency must be avoided. Thank you.

[Applause]