

Peterson Institute for International Economics
Warwick McKibbin on building economic projections for better policy
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[00:00:14.07] - Anjali Bhatt

Hi, and welcome to PIIE Insider Live. I'm Anjali Bhatt, Communications Manager and Research Fellow here at the Peterson Institute for International Economics. I often say that one of my favorite parts of my job is that I can walk into the offices of some of the world's top economics experts and ask them anything, and they answer. So with PIIE Insider Live, you're coming with me to ask those questions and get those answers that you won't hear anywhere else. Today we're speaking with Warwick McKibbin, non-resident senior fellow here at PIIE and Emeritus Distinguished Professor of Economics and Public Policy and Director of the Center for Applied Macroeconomic Analysis in the Crawford School of Public Policy at the Australian National University. Before we start, if you're watching on Zoom, feel free to put your questions in the Q&A box. So, hi, Warwick. Thanks for joining us.

[00:00:57.09] - Warwick J. McKibbin

Anjali, great to be here. Thanks.

[00:00:59.04] - Anjali Bhatt

Okay, so economic modeling is your thing. And I've actually wanted to ask you this since you started at the institute, really. You know, I used data a decade ago in undergrad, and then I decided that I'm a words person, and now I'm a communications manager. But to me, the economic modeling seems like a bunch of like coding really complicated if-then statements. Is that, is that close?

[00:01:27.16] - Warwick J. McKibbin

Well, there are if-then statements, but it's actually, the idea is to take a very complex economy and work out how it actually works and to put that into a computer because it's too hard to do all the complexity in your head. And what we do is we actually try and go not just at the national economy, but we try to build the global economy because there are no closed economies. Even

the US is only 20% of the world. And when you're analyzing impacts in the US of their own policies, you need to take into account the impacts on other countries and how it spills back. And so it's very complicated. In building a model, it's straightforward. You need the data. And we have a very large set of global databases that we manage to make consistent. So there's a lot of algorithms that look at the data, make sure there's not problems with data from, say, Brazil or Argentina because of inflation. We then have to write the equations for how we think households behave, how we think firms behave, how we think governments behave. What do the central banks say they are going to do?

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And we write down that behavior and then we have to solve the interdependencies. And so it's really quite straightforward. You have firms and households interacting in markets. So we have to design the markets and then we have to write the computer code that can be used to solve this complex system. And that's where the if-then statements appear. It's all written in Python and it's— our modeling is all open source so people can download the equations, they can download the parameters. If you're willing to subscribe to the software, you can actually modify the model and build your own version of the world for doing interesting questions. And there's always an interesting question.

[00:03:03.14] - Anjali Bhatt

So when you're, when you're looking at the relationships between firms and households and governments and central banks, you said there are no closed economies, everything is open. So are you looking at the relationships between, you know, firms in one country to households in another one? How are those relationships sort of mapped?

[00:03:24.07] - Warwick J. McKibbin

So if you write down how a household makes a decision, we put in the context of a utility function. That means that a household will consume goods and services not only made in America but made all over the world. And so if you look at the entire set of all goods and services available, the household will make a decision of what goods to buy and that from what countries. And that will depend on the prices of those goods relative to each other. It'll depend on the household's income and it will also depend on the household's wealth. And the household's wealth would depend, and its income would depend on how much they earn as workers, how much they have equity holdings so they get a return on financial assets, and also depend on what they think future taxes will be. And so the households themselves are making a decision where there's a lot of inputs coming from all the other parts of the economy. And the

same with firms. Firms are hiring, they're using capital, they're hiring workers, they're buying energy, they're buying materials, and they're trying to maximize profits based not only on what's happening today, but on what they think will happen in the future.

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And one of the advantages of what we do is we take into account the expectations about the future, which comes from having the agents use the model to form their expectations. So it's quite complex because the future depends on the present and the present depends on the future. And so in reality, it's not just what is the world doing today, but when people are making decisions, they're also needing to know a little bit about, well, where the world will be in 5 or 10 or 20 years.

[00:04:50.04] - Anjali Bhatt

How do you, so I mean, like you said, the future depends on the past or the present and the present depends on the future. I guess, I mean, inflation expectations are, I guess, one thing that, you know, we know affects inflation. Is that true of other things too? How do we model the future and the present?

[00:05:12.21] - Warwick J. McKibbin

So it's complicated, and that's why I think you need a model. It's very hard to see how any decision maker can make a policy decision without using a model, even though you might argue, well, the model itself is too simple. But actually, not having a model is even worse. And that's why a lot of policies are badly designed. So you need a model to put all the complexities together and to test different types of policies. Our philosophy is not to work out the optimal policy, it's to work out the policy that does least damage if you have the wrong model. And so that's the way we sort of design policy. But in terms of expectations, to give you an example, so what is the equity market meant to be doing? The price of its shares should be the present value of the dividend stream of a particular company. And so when you look at the share market, you people, someone in the market is pricing the value of that firm not based on what it's doing today, but based on the dividends you expect in the future. And that depends on interest rates, it depends on economic growth, it depends on will AI have an impact.

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But you can look at the share market price and that gives you the information you need to make about how you might allocate your portfolio across different types of equities. So it's true when you're making investment decisions, it's true when you're making employment decisions, which

sector, if I'm working, will I lose my job next week or should I retrain? Brain. So every decision actually has a forward-looking component. If you're a wage negotiating— in a wage negotiation, you want to know not only what you think the economy would be doing, but what will be inflation next year or over the period of your negotiation. So the expectation's really important, and that's one of the big problems in economics is we really don't understand expectations. There's different assumptions you can make, and you can change those assumptions within a model and find out how important each of the assumptions are.

[00:07:00.10] - Anjali Bhatt

Okay, so when modeling all of these policies, so in 2024, we published one of your papers and then iterations of that on the projected effects of then-candidate Trump's policies. And then since he got into office, some of those other policies too. In the comms department, when we were, you know, working with the paper, we had, we were very careful about how we worded the results of, of the, of the model. And so we— you, you can see in the model, you construct for the future a baseline, like, sort of business as usual scenario, um, and then change variables to see how the outcomes differ from that, like, baseline business as usual, right?

[00:07:47.17] - Warwick J. McKibbin

Yes.

[00:07:47.29] - Anjali Bhatt

Yeah. And so I think we landed on describing it as like inflation or whatever would be X percent higher than if the policies had not been put in place.

[00:07:57.18] - Warwick J. McKibbin

Correct. And so there's two parts of this. One is you need a baseline because you need some projection without the policy in it. And of course, projecting the world for the next one year, let alone for the next 50 years, is incredibly complex. But the key question is not really what's in the baseline. It's if you change tariffs by a certain amount, how much will the economy change? What will go up, what will go down. So you perturb the model with that policy. You assume a certain amount of information that agents have. Do they think it will last forever? Do they think it will go away in a week? It's very hard to do in the current environment. And then you look at the difference. And so when you think of what a tariff is, it increases the price of imports and either the importer, the consumer or the firm has to pay more or the exporter on the other country has to receive less. And we use empirical evidence that about 90% of the pass-through goes to

domestic citizens. So that means that price of not only the goods they buy, but the price of the goods that are being made by American companies will go up because the input costs go up.

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So that's going to be an inflationary shock. And as well, it's going to be a reduction in output because the demand for those goods will go down, either the foreign goods or the domestic goods. So you expect to see production fall and you expect to see inflation rise. And the numbers we're getting out of the model are consistent with historical experience. But also, if you look at today, where you've got to control for the war, but if you look at the information, we got about 1% higher inflation. We lost probably about 8% of manufacturing jobs and 10% of agricultural jobs within 12 months. So that's about now. If you look at the data, that's consistent, although there are other things happening in the economy. So you can't claim, we can't claim success, but we can claim that, yes, it was pretty ballpark close to what we're observing. And the tariff issue is not over. And the question then is, well, do people keep believing that this will stay or will it change? Will there be another diversionary policy to try and distract from the problems caused by that particular policy?

[00:09:58.01] - Anjali Bhatt

In those models, you— so you change tariff levels, but then you also ran how— what the changes would be from deportations and the erosion of Federal Reserve independence. How do you code erosion of Fed independence? Tariffs are just, you know, changing percentages. That's right. But what does Fed independence mean in a model?

[00:10:20.08] - Warwick J. McKibbin

Well, that's a good question. And when you're doing these sort of scenarios, first thing you do is you ask the question. And the question here is, what happens if the Fed's independence is eroded? Then you ask, well, how do I take the concept and put it into a modeling framework? And then the third stage is, now I have results. What are the insights that we get and how sensitive are those results to the assumptions that we're making? So Fed independence was, was complicated. The way I thought it through was, well, there are some countries out there that don't have independent central banks. There are countries that do have independent central banks. There's a literature on what the implications of independence are. And the answer in that literature, whether it's advanced economies or emerging countries, is that the countries that don't have central banks which are independent tend to have inflation rates higher than the other countries by between 2% and 8%. So in other words, if you have an independent central

bank, your inflation rate is going to be a lot lower. And so we use that and said, well, now suppose the Fed's target for inflation isn't 2%, but suppose it's 4% or 5% or 6%.

[00:11:23.07]

So we've increased the expected target of the Fed, the markets and the households and everyone in the economy are expecting. And so firstly, then we think, well, the Fed's going to be more— it's going to be a looser policy. That's the first component. The second component is in a lot of countries that have these big financial system changes, it changes country risk. And so we know from the Asian financial crisis, we know from the global financial crisis that there was an increase in the risk premium of holding assets in certain countries. And so we looked at the scale of those shocks. And again, the US is different because the US is the center of the global financial system.. But the evidence was between 200 and 800 basis points higher return required to hold the more risky assets in that country. So in other words, what do we expect the risk of holding US assets might become? Well, we looked at the data and said, let's pick a low estimate. Let's assume that a foreign investor needs 200 basis points, 2% higher return on holding US assets. That's government bonds, let's say. And so we need to get a much higher rate of return on holding those assets to justify holding the assets.

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And so we have these two components. One is a short-term liquidity injection. The other is a longer-term loss of confidence in the independence of the central bank. And what it does is it actually does a really interesting thing. It stimulates the economy for a year or two because you're pushing liquidity into the economy, you're increasing demand. So inflation will start to rise, but output will start to rise. But because you've actually increased the risk of investing in the economy, the US dollar depreciates, people pull capital out of the US until the rates of return adjust for the risk premium. And so in the medium term, at the end of 2028, actually, you start going into a slowing US economy. So you get a sugar hit, you have a party, and then you have a hangover. And the hangover is a persistently damaging economy, damaged economy, because that capital would have come to the US. Now goes to other parts of the world. Now that's not a bad thing for everybody else because they're now getting capital at a cheaper price than they would have got because the US was sucking all the capital out of the world economy.

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So from a development point of view, as long as the reallocation of capital is done appropriately, either through markets or through sensible policy, that's actually a good thing for the world. It's not a good thing for US citizens, however.

[00:13:45.28] - Anjali Bhatt

So a lot of this has to do, as we've said, it has to do with expectations and risk. I mean, that, you know, that makes sense for for the Fed also, but you have a paper coming out soon here running these models on the economic effects of the Iran War without, you know, you don't have to spoil the paper, but what can you tell us from modeling this? I mean, there's been, the expectations has changed daily for this war. How do you model that and what are you seeing?

[00:14:19.21] - Warwick J. McKibbin

Yeah, so that's a very good question. And so the answer is that we do a range of scenarios. When we started doing this, we were thinking maybe \$100 a barrel would be a reasonable number. We then got up to \$180 a barrel. But in the end, the way we model this is not actually picking a price. It's actually saying, let's disrupt supply. So where's the war? It's in the Middle East. What's being exported? It's natural gas, it's oil, it's refined petroleum. It's also fertilizer.. And so we take that information and we sharply reduce the supply, and that sharp reduction in supply will cause prices to rise and will have differential impacts on different countries. For example, what we find in the scenario where we have a— sorry, I should mention the two scenarios. One is that it happens in 2026 and it's over, which is one plausible scenario. The other is that it happens in 2026, the same amount, but then there's another shock in 2027, which is half as big. 2028, which is half as big again. And so over 3 years you get this, this shock which eventually fades out. That's probably the most plausible scenario because now there's been damage done to gas facilities in different countries.

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There's been damage done to a whole range of physical assets. So those 2 scenarios are plausible. Now, in the first year, they're exactly the same shock, but the results are very different because if you think this goes away, that's very different than you think a shock will be persistent. If it's persistent, you'll get a lot more resources going in countries to restructure their economies to avoid the fact that this might happen again. And so you get a very different investment response in other countries. So to give you an example, so the US, it does get impacted negatively. US inflation goes up by roughly 1%. US output is down about 1%. In Japan,— it's much more damaged. Its output falls by nearly 3%. Why is that? Well, because they import a lot of oil and a lot of gas from the Middle East. The US has a lot more of its own resources domestically, but is still reliant on global markets. Korea is even more affected than Japan. Why is that? Well, because Korea is very dependent on Middle Eastern oil, but also it

exports a lot of refined petroleum and diesel to other countries. And if there's no inputs, there's no outputs for export.

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And therefore, countries like Australia can't get access to the Korean exports. And so the trade linkages are very important, and we model the trade effects. We also model the capital allocation effects and the cross-country production networks. And so the fact that you turn off one of your inputs, that can lead to a change in the output in a different sector that you don't realize is important when you're just thinking about the oil market.

[00:17:01.08] - Anjali Bhatt

So in terms of, especially in the scenario where you know, uh, we're expecting it to keep going. Um, that means that, uh, like you said, so capital is going to be reallocated sort of in different ways. Um, does the model show that? Like, like, does it show where, uh, the way that I'm thinking about this is that, um, because this is about— I mean, it's, it's about oil— can you see that countries are investing like in renewables? Is that something that we can model?

[00:17:32.29] - Warwick J. McKibbin

So in the model we use— so we use different models for different questions. In the model we're using for this analysis, we don't actually have detailed breakdown of the renewable energy sector. Actually, in the model we use for climate change, we do have detailed breakdown. So we do have solar, wind, biomass, nuclear, etc. We haven't run this in that model, but your question is exactly right. What you will find is this will be a mass, very large impulse into the uptake of renewables. Who will benefit from that? Well, China, because they're the world's leading producer of renewable technologies. And so if you're going to ask who won the war, well, one of the candidates would have to be China, given both their geopolitical repositioning as well as their production structures moving away from fossil fuels into renewables over time.

[00:18:18.13] - Anjali Bhatt

Okay. So I guess let's zoom out a little bit here. How— with all of these models and we've talked— we talked earlier that you have run a lot of different economic shocks in these models over, you know, decades. How, how do we use these or how do policymakers use these models to make better policy? What is the most useful of these?

[00:18:42.29] - Warwick J. McKibbin

So there's not just policymakers, although we do supply models to central banks and treasuries, also to hedge funds and corporations. They use them for strategic planning. They use them for short-term and long-term analysis. From a policy point of view, again, the first question the policymaker will ask is they usually have a prior. So they say, if I do this, this is what's going to happen. And they may tell the staff in the Treasury, can you give me the answer that corresponds with my answer? The models are useful because they're a way of testing that. And many times in different situations, we've had a request coming from above down to a junior. And most of the people who run these models in these agencies are actually quite junior. It's very hard for them to push back against more senior officials. But when the modeling gives the completely opposite answer and it has a reason, then that's the main insight. It's not the number, it's the story behind why is this the opposite sign to what we expect. You can push that back up and you can actually get the decision makers to reassess their priors because their priors are based on back-of-the-envelope calculations, which most times could be good.

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But very importantly, sometimes it's the opposite sign than what you might expect.

[00:19:52.27] - Anjali Bhatt

So how do you decide what scenarios to run? How many? What are the different sort of inputs to these scenarios? Because I mean, you can, you could run anything.

[00:20:02.23] - Warwick J. McKibbin

Yeah. So basically, it's both looking at what's happening in this world today, what we expect might happen, but also clients or governments or others will come along and say, we want to have some long-term planning in this area. Could you help the team do the analysis? And we provide the the analysis. Now, one example of one work, one project which turned out to be a really good idea was the work we did on the COVID pandemic before the pandemic occurred. And we'd been involved with a comparison exercise at the IMF in 2019. It was like wargaming, what if there's a pandemic, which I thought was very farsighted when you look back at it. And there were two different studies that were looked at. One was our work on bird flu that we did, using our model. And Jim O'Neill had done the work on antimicrobial resistance for the, firstly, well, for the UK government. And so the IMF wanted to know, under those two different types of pandemics, how should policy respond? So Jim suggested to me that I should use our framework to analyze antimicrobial resistance because our model was a lot more complex than the model they'd been using.

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So we developed it and we were ready at the end of 2019 to do the analysis. And then we heard from China that there was an outbreak of a potential pandemic in Wuhan. And so we took that data and we analyzed, we created an epidemiological framework. We overlaid the model and we looked at 7 scenarios of what might happen from December data. And then in January and February, we produced the report that said there were 7 scenarios. 3 of them were global pandemics. That were really bad. And we based that on the Hong Kong flu, the Asian flu, and the Spanish flu. So we used historical data. We used current information on infection rates, morbidity, death rates, etc., structure of the population, because there's different effects on different ages. And we produced this report. It was so frightening. We didn't publish it. We sent it to all of our users or treasuries, central banks. I presented it at the World Bank and the IMF.. We sent it to the Fed, the Australian government, Japanese government, and then we released it at the beginning of March. And about 2 weeks later, they declared a pandemic. And we already had the results for all countries, all sectors, different scenarios.

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And it was very, very informative and had lots and lots of downloads. And again, we didn't expect there'd be a pandemic, but we just asked the question, what if?

[00:22:26.10] - Anjali Bhatt

And so, I mean, that must have been scary to get those results and then also see a lot of that bear out in the world.

[00:22:35.08] - Warwick J. McKibbin

What—

[00:22:35.23] - Anjali Bhatt

when you sent these results to governments, did— I mean, I guess you can't know directly, but how did these results sort of shape policy based on— I think especially based on the level to which— the complexity to which you guys modeled it? That leaves a lot of space for sort of policy levers. Did you see any of that happen?

[00:23:00.04] - Warwick J. McKibbin

Yes. So scary was an understatement because I was in Washington at the time and having seen the results, I jumped on a plane and went back to Australia on the 9th of March. And then

as soon as I arrived, I was invited to Parliament House to the Prime Minister's dining room to brief all of the secretaries or senior officials in the Australian government. No politicians in the room. To talk about the scenarios. And there was another economist invited who was very skeptical of that, you know, that this was actually going to be a problem. And so we had quite a heated discussion. I had two main points that I wanted to push. One was how do you finance it? You're going to have to support industry. You're going to have to support companies because if it really is a bad scenario— and again, it's always a good idea to design policy based on the worst case. What happens? You know, how should that be supported? My argument was it should be income contingent loans, which means you help industries and you help households, but if they fail, the industries fail, then the money's forgiven. But if they succeed, they give it back.

[00:23:59.22]

And that wasn't done. The second was to actually close the borders in Australia until we had extra information, but to then open it fairly quickly afterwards. That was the mistake the government made. They kept borders closed for, in my view, way too long. But what was really interesting was the counterargument was, well, 'This is nothing.' It's like the climate change skeptic, you know, 'This is nothing.' And so the question I ask is, suppose the counterargument is correct and we put in place these controls and it turns out to be nothing. Suppose I'm right and we don't put in controls and it turns into a major disaster as of Scenario 7. The damage is so great that if you had to choose between those two, risk minimisation would choose close, get the information, manage the shock, Don't just go free-for-all.

[00:24:47.13] - Anjali Bhatt

I feel like these are, these are things that, um, the models are something that both, uh, you know, the, the bureaucrats and the politicians should, should look at more. Um, okay, well, let's talk about Australia also. You, you mentioned that you're obviously, you're from Australia. Um, I feel like a lot of Americans just like don't know that much about sort of what's going on in Australia except for like kangaroos and stuff. So what's going on down there?

[00:25:16.26] - Warwick J. McKibbin

Okay, so we like to keep Australia a secret because, you know, it is a great place to live. It has its flaws, as in most societies, and we do have political issues that are sort of impacting on the economy today. It's a landmass the same size as the US, but it has 25 million people, which is vastly smaller than the US. It's got enormous endowment of resources, minerals, critical minerals, oil. Ironically, although we don't extract very much these days, incredible renewable

energy resources, wind, solar, and has a very high investment in education. Although that has been one of the problems in the last decade is the lack of funding going to education. It relies a lot on immigration. Immigration policy isn't open borders. It's basically any immigrants. There's two criteria. One is family members and the other is high productivity people that meet certain categories. They get points for different abilities. And so we can actually bring in migrants who are filling in positions which are actually needed. And you see a lot in healthcare, you see a lot in other services, construction, etc. And so it's a managed system, although there has been a lot of migrant flows in the last year or two.

[00:26:33.02]

One of the big problems we face is the information coming through social media from the US in particular, but also from Europe, is perceived to be about Australia when it's not. So it was interesting during the— after the election in the US and stolen election, we had— and I used to live opposite the Prime Minister's residence, and we had trucks going around the Prime Minister's residence with American flags. They're even the wrong flag. They should have been the Australian resistance flag, but it was the Southern flag. And it was just people thought that this information was about Australia when it was actually not about it at all. It wasn't very many, but it was still ironic. You think, well, that's the wrong country.

[00:27:17.26] - Anjali Bhatt

So in this economy that is highly, not highly reliant, I guess, but there are a lot of natural resources. Is it highly reliant on the natural resources?

[00:27:27.20] - Warwick J. McKibbin

It is.

[00:27:28.01] - Anjali Bhatt

Yeah. Okay. And I have to ask this question, as we've been talking about for the last couple of weeks, what are the effects of the Iran war on Australia's economy?

[00:27:37.05] - Warwick J. McKibbin

So Australia is actually a net energy exporter. And so from an economic point of view, it should be a positive terms of trade effect, which in fact it will be in terms of the currency. The trouble is our net energy exports are largely gas. We have, if not the second largest reserves of natural gas. And we take them from the northeast to the northwest, and we export a lot of natural gas to

Asia from those sources. We also have oil, but the oil reserves have been not been explored or extracted because of the attempt to decarbonize. And so we have a lot of coal. And again, the decarbonization issue has sort of pushed down the production of coal in Australia for domestic use, but we're still exporting a lot of coal to Asia, in particular India. And so we have a lot of potential income from, from energy in Australia. But again, in domestic market, the policy decisions on the natural gas, we didn't make the Norway choices of creating a sovereign wealth fund. We basically brought in the foreign investors and let them keep most of the revenue. So even though it's a great resource, most of it, the bit that filters into Australia is through tax revenue, which is quite low.

[00:28:47.10]

Because of the way the tax system works and through employment of local workers and local capital. And so we really made a mistake, I think, in terms of the way we're managing our resources, in terms of the benefit, the national benefits. So at the moment, we have a very small amount of stockpile of fuel. We have 30 days of fuel, whether it's diesel or jet fuel. And that's causing concerns about queuing and rationing. And it's also causing quite a large price spike. Which, given the endowments we have in the ground, is really quite surprising. And again, that's a combination of poor policies over many years, as well as trying to decarbonize the economy along a path which at this point we probably need to sort of slow down that process, but keep it going, but make sure that we've got a transition fuel. Okay.

[00:29:33.08] - Anjali Bhatt

Well, we are almost at time. Wow. We covered a lot of ground there. So to wrap up here, What will you be looking for in the next 3 to 6 months to keep an eye on?

[00:29:43.13] - Warwick J. McKibbin

Oh, I think, I think the— well, firstly, there are the Middle East war is key, but also I think these sorts of shocks trigger adjustments in the economy where there are misallocated resources. So if you think that in fact the AI boom is— it's real, but maybe the valuations of different companies in the Magnificent Seven and out and around that area that could burst those bubbles and there could be a repricing. And we've already seen some of the Magnificent Seven share prices come down quite a lot to pre-boom prices. There's a— in my view, there's a lot of misallocation of capital in equity markets and in the, in the financial system generally. And so this sort of shock, which leads to movements in all sorts of economic variables, could unravel another shock. And so you couldn't rule out, for example, some form of financial crisis. You couldn't rule out some other form of loss of confidence in the US, although People are always

optimistic about the US, but the US fiscal position has reached a point which is close to being unsustainable unless the AI boom produces enormous revenue flows to the government. And it's not clear that will be the case.

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So there's these knock-on effects and these complexities that you're basically— the modeling we're doing is trying to get a handle on, but it's very, very complicated.

[00:30:56.27] - Anjali Bhatt

Much to watch.

[00:30:57.27] - Warwick J. McKibbin

Thanks.

[00:30:58.23] - Anjali Bhatt

All right. Well, that's that. Well, right on time. Warwick, thank you so much for telling us all about modeling and Australia. And thanks to all of you for joining us for this edition of PIIE Insider Live. What did you think? What do you want to see next? Let us know at meetings@pie.com. And if you're not already subscribed to PIIE Insider, the newsletter at pie.com/subscribe. Thanks again to Warwick and thanks to all of you for joining us. The next Insider Live will be with Tianlei Huang on May 19th. We hope to see you there.

[00:31:27.23] - Warwick J. McKibbin

Thanks, Angelique.