Historical Shifts in the Rhythmic Organization of Popular Music:
A Corpus Study of Meter in R&B

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Hello. [NEXT] My talk today will be in two parts: In the first part, I'll talk about meter in popular music in general. [NEXT] In the second part, I'll talk about the history of meter in R&B music in particular.

I'd like to begin the first half of my talk by asking a simple question, a question that—if you're a music major—seems so basic that the answer may seem obvious. The question is: [NEXT] What is meter? If this were a class, I'd probably ask some of you how you would define meter, but we don't have that format today. So I'll just ask you to take a moment to think about how you'd answer this question.

[NEXT] In standard music theory textbooks, some of which are shown here, meter is traditionally defined as the pattern of strong and weak beats that the underlies rhythm, or the way in which accented and unaccented beats are grouped into recurring patterns. [NEXT] Some common meters are duple meter, which has two beats per bar, triple meter, which has three beats per bar, and quadruple meter, which has four beats per bar.

[NEXT] These meters, of course, are normally represented by the time signature, such as those shown here. Indeed, the Grove Dictionary of Music defines a time signature as the notational symbol that <quote> indicates the meter of the piece <unquote>. But of course, time signatures show not just the grouping pattern of accented and unaccented beats in a bar; they also show how those beats are divided. [NEXT] Simple meters, such as 2/4, 3/4, and 4/4, have the beat regularly divided into two equal parts, in contrast to compound meters, such as 6/8, 9/8, and 12/8, where the beat is regularly divided into three equal parts. This general philosophy of determining meter by the number of beats in a bar and how those beats are divided generally holds even through odd and asymmetrical meters, such as 5/4 and 7/8.

This basic system has been sufficient for a few centuries, but when we think about meter in popular music, we need to move beyond the time signature. To appreciate why we need more than just the time signature, let's consider a few examples.

[NEXT] Take, for instance, the song "Teardrops on My Guitar" by Taylor Swift. I'll play the song now, and as you listen, think about how you'd categorize the meter of this song. Feel free to conduct along with the song or do whatever else you need to do to untangle the rhythmic organization. [PLAY] I would expect the vast majority of us would say that this song is in a simple quadruple meter, specifically 4/4. [NEXT] I would definitely agree, and part of what makes the 4/4 meter so clear is the snare on beats 2 and 4—the "backbeat"—at a moderate tempo of about 100 BPM. Notice also that with this reading of the meter, the melody is moving mostly in eighth notes and the chords here change every bar.

For those of you in the audience who are Swifties, you may know that this is actually NOT the version of this song that was released on the album. [NEXT] Instead, what we just heard is a bonus cut "pop" version of the song. [NEXT] Let's actually now listen to the album version. As you listen, ask yourself if the meter in the album version is different OR NOT than the meter in the pop version; if so, why, and if not, why not. Here we go. [PLAY]

I think we would all agree that this album version sounds slower than the pop version. Most notably, the drummer seems to be playing half as fast in the album version. Other than that, though, everything else in the song is going at the same rate as it was in the pop version. Taylor Swift is singing at the same speed in both versions, and the amount of real time between each chord change is the same.

[NEXT] As a result, I've transcribed the album version of the song like this, which keeps the vocal as eighth notes and one chord per bar. The drum beat has changed, though, and that has a dramatic impact on our perception of tempo, such that the song feels slower overall, even though the melody and harmony are going the same speed. I would say this change in the drum beat is dramatic enough to say that the meter has changed. But how would that change be notated? [NEXT] We could say that the album version is in cut-time—in other words, a meter of 2/2. But that's not the way commercial musicians typically describe this situation. [NEXT] Instead, they would say the song is in 4/4 with a half-time feel, as I've notated here. In other words, commercial musicians separate the drum feel as something distinct from the time signature when talking about the rhythmic organization of a song.

To understand why the drum feel and time signature need to be separate aspects of meter, we'll need to consider a few more examples. [NEXT] The song "Mama's Broken Heart" by Miranda Lambert, for instance, has a double-time feel. As you listen to this song, note that the drums imply a tempo that is twice as fast as where you will likely want to tap your foot. There are thus two viable beat layers in the song: the faster kick-snare beat and the more moderate beat at which you'd tap your foot or bob your head. Let's listen. [PLAY] We could say that the meter here is 8/8 [NEXT], which would be an attempt to incorporate this drum feel into the time signature. [NEXT] But commercial musicians will instead stay the song is in 4/4 with a double-time feel, distinguishing the drum feel as a distinct metrical aspect from the time signature.

The interaction of drum feels with the time signature becomes especially complicated when we go beyond simple meters. To understand this, let's put aside drum feels for a moment and consider how commercial musicians think about divisions of the beat. [NEXT] Let's listen to the song "Higher Ground" by Stevie Wonder, which I hope you'll agree has four beats per bar with a normal drum feel. You'll also hear a consistent triplet feel in the synthesizer parts. How would you categorize the meter of this song? Let's listen. [PLAY]

[NEXT] You might say that "Higher Ground" is in 12/8, but most transcriptions of this song say NOT that it's in 12/8 but rather that it's in 4/4 with a "shuffle feel" or "eighth-note swing" [NEXT], as shown in this excerpt. In other words, commercial musicians not only separate the drum feel as a distinct part of the meter from the time signature; they also consider swing as distinct part of meter from the time signature. This is a particularly helpful approach, since swing on the eighth notes can be close to a triplet feel, it was in "Higher Ground," or the swing can be harder. [NEXT] Listen, for example, to the song "Girl They Won't Believe It" by Joss Stone, and notice that the swing is so hard in the drums that it's almost like a dotted eighth note followed by a sixteenth note, despite the triplet fills that precede the chorus. [PLAY]

For me, meter in popular music becomes especially interesting when swing and drum feels interact. Consider, for example, the song "Chuck E.'s in Love" by Rickie

Lee Jones. As you'll hear, the chorus of the song is in 4/4 with swing on the eighth notes and a normal drum feel with the snare on beats 2 and 4. But after the chorus, in the outro, the song switches to a half-time drum feel, with the snare on beat 3, still though with swing on the eighth notes. Let's listen [PLAY]. Although perhaps in some cases we could say that eighth note swing is like a 12/8 time signature, and that a half-time feel could be notated as a 2/2 time signature, there is no time signature that could capture both a compound meter plus a cut time or half-time feel. And hopefully now it should be clear that when we talk about meter in popular music, the time signature alone cannot indicate the complete metric structure of the music.

The inadequacy of traditional time signatures in capturing meter in popular music does not stop there. I have three more examples in that regard that I'd like to share. The first example is the song "Poison" by Bell Biv DeVoe. I would say the song is in 4/4 with a normal drum feel. But what else is going on with the rhythmic organization of the song? Listen and see if you can figure it out. [PLAY] As you may have noticed, there is swing on the sixteenth notes here. [NEXT] If you had trouble hearing the swing sixteenth notes, perhaps a visualization will help. [NEXT] This is a waveform view of the opening snare, and as you can see in the top line, the "and" of each beat divides each beat into two equal parts, but as you can see in the bottom line, the "a" and "e" parts of each beat do NOT further divide the meter into two equal parts. In other words, the sixteenth notes are swung. As this example also shows, swing on the eighth notes and swing on the sixteenth notes are mutually exclusive. And while perhaps we could, at least in some cases, represent eighth note swing in the time signature, like calling it 12/8, it's a bit messy to represent sixteenth-note swing in a time signature. [NEXT] If we had to, I guess we might say it's a time signature of 24/16, but that's not the way popular musicians think about it.

[NEXT] Again, I find meter becomes especially interesting when swing and drum feels intersect. In this regard, consider the song "Redneck Woman" by Gretchen Wilson. The verse is basically a 12-bar blues form. As you listen, notice the snare on the "and" of each beat, which creates the double-time feel over the 12-bar blues form, along with the swing on the sixteenth notes. [PLAY].

Before we get to my last example in this first part, I need to clarify one thing. Based on what I've discussed so far, I may seem to be implying that popular musicians

never use compound meter, such as 12/8, preferring instead to think about the meter as having swing. The distinction between compound meter and swing, though, has to do with tempo. [NEXT] Here, for example, is an excerpt from an Ear Training book for the Contemporary Musician by Wyatt, Schroeder, and Elliott. On page 77, the authors write that <quote> In popular music, compound meter is generally used only at slower tempos; when the tempo picks up, the triplet feeling is better defined as shuffle or swing <end quote>. The authors don't specify what exactly it means for a tempo to pick up, though. How fast is that in terms of BPM? Nonetheless, there are clear cases of a slow compound meter that obviously would be best considered as a 6/8 time signature.

[NEXT] As one example, consider the song "A Wolf at the Door" by Radiohead. The song is clearly in 6/8, as I hope you'll agree. Notice also, though, that in addition to being in a compound duple meter, there is also swing on the sixteenth-note level. [NEXT] The sixteenth-note swing is most obvious, I think, in the hi-hat part, so listen for that. [PLAY] Do you hear the sixteenth-note swing? We could count this "1 and 2 and 3 and FOUR and 5 and 6 and," with the snare on the fourth eighth note of the bar. 6/8 with swing on the sixteenth notes is a very common meter in popular music, by the way, and I think it's easier to think about it like that than to say, [NEXT] for instance, that the time signature is 18/16.

OK, that should be a sufficient crash course on some of the issues with meter that arise in popular music. There is a lot I didn't talk about, such as triple meter or odd and asymmetrical meter. But that should be enough of a background to prepare you for the second half of my talk. [NEXT] I'll thus now turn to Part II of my talk, in which I'll discuss a recent study I conducted on the history of meter in R&B music.

[NEXT] I'll structure this second part of my talk like a traditional scientific paper. We've already gone through most of the background, and so I'll move quickly to discuss my methodology, my statistical analyses, followed by a brief discussion. First, though, I want to give a small bit of context for the study.

[NEXT] Recently, I was asked to contribute a chapter to the edited collection *Expanding the Canon: Black Composers in the Music Theory Classroom*, edited by Melissa Hoag, which was published last year by Routledge. [NEXT] I ended up

writing a chapter entitled "Developing Contemporary Rhythm Skills Through Contemporary R&B." [NEXT] As I was writing the chapter, I was trying to find song examples in 4/4 with a normal drum feel and eighth-note swing. Off the top of my head, it was easy to think of examples from 1960s R&B that were in 4/4 with a normal drum feel and eighth-note swing. [NEXT] The song "Baby Love" by the Supremes, for example, has a classic swing eighths feel and a normal drum feel in 4/4. [PLAY] But after many hours and hours of searching—and I searched a lot—much to my surprise, [NEXT] I could not find any R&B song from the last four decades that had swing on the eighth notes with a normal drum feel in 4/4. In contrast, I could find a lot of contemporary R&B songs with swing on the sixteenth notes. There seemed to have been some shift that occurred at some point in history between eighth-note swing and sixteenth-note swing, at least in R&B music.

[NEXT] So, to quote Marvin Gaye, "What's Going On?" Is eighth note swing truly rare in contemporary R&B? If there was a shift between eighth note swing and sixteenth note swing, when and how did this shift happen? These are the kind of questions best answered with a corpus study, so that's what I decided to do. [NEXT] For those of you not familiar with a corpus study, it's a type of research where you look at a lot of musical works, like songs, and try to find trends or patterns within that large collection of music. A corpus study of music is thus kind of like data science with music.

[NEXT] This brings me to my methodology. The first step in a corpus study is to pick the corpus, and by that I mean the body of songs that the researcher will look at. Around the time I started this research, there was a conference on popular music that was going to take place outside of Detroit, Michigan. And so I thought "What better way to look at the history of meter in R&B than in Motown songs, which was based in Detroit, since Motown has played such a big part in the history of R&B."

[NEXT] Motown also makes for a nice body of music to study since it has a clear beginning and end date, from1961 to 2005. Here, for example, are some albums from the Motown catalog, which includes artists like the Marvelettes, the Jackson 5, Stevie Wonder, Lionel Richie, Boyz II Men, and Erykah Badu. [NEXT] Overall, the Motown catalog includes 205 studio albums, which is what I used to create my corpus. In particular, I did not include any soundtrack albums or greatest hits albums

or any of the other non-standard formats shown here. I just used studio album releases.

Now I didn't listen to every song on those 205 albums. For those of you who have studied a bit of statistics, you'll know that one of the nice things about statistics is that it teaches us that we don't have to look at every single data point to get an idea for large-scale trends. [NEXT] So, for this research, I divided the Motown catalog into periods of five years, which I call "pentades" for lack of a better term. From each pentade—that is, for each five-year span—I took 50 songs, randomly sampled without replacement, from the Motown albums during that five-year period. [NEXT] Of course, various substyles of R&B crossover and overlap these five-year spans. But this method, I think, promised to be sufficient enough to give a sense of the big picture. [NEXT] Overall, choosing 50 songs randomly from each of nine pentades gives a corpus of 450 songs total, which is the corpus from which all the data I'll be reporting on today is drawn.

With the songs selected, the main question I faced was how to categorize the meter of each song. After all, I was trying to look at the history of meter over time. But categorizing the meter of a song is not always as straight forward as the first part of my talk today perhaps made it seem, when I was giving you clear examples. [NEXT] Remember, for instance, those authors of the ear training manual who said that the compound meter is generally only used at slower tempos, whereas when the tempo speeds up, it's preferable to think of it as 4/4 with swing. These authors, though, did NOT give a specific tempo at which that transition from compound meter to swing occurs. And there are definitely some cases, as a result, where it's ambiguous.

So because meter can sometimes be analyzed in different ways, I needed an encoding system for my corpus that did not rely on the standard way that popular musicians talk about meter. One of the critical aspects of any corpus, like any work with data, is that it is reproducible, and so I needed to be able to encode the meter of the songs in a consistent and objective way, such that basically anyone else would analyze the songs in the same way.

[NEXT] Ultimately, here was my solution: Rather than trying to determine the best time signature for a song, like 6/8 or 4/4 with swing, I decided to simply look at the

rate of the kick and snare, and then I encoded [NEXT] whether the beat given by the kick and snare was divided into two equal parts or not. When the beat given by the kick and snare is NOT divided into two equal parts, we might call it compound meter or we might call it swing eighths, depending on the tempo. The working hypothesis for my study was that at some point in the history of R&B, the pathway on the right, shown in red, became much less common, especially given moderate or faster kick and snare rates.

[NEXT] Using this approach, swing sixteenth notes in a four-four meter would be categorized as NOT dividing the next level down in the metric hierarchy into two equal parts, as shown in green. The working hypothesis predicts that this green pathway becomes more common at some point in the history of R&B.

[NEXT] OK, let's now take a look at some results.

[NEXT] Here is a table of average kick-snare rates across all 50 songs in each pentade. For the sake of this corpus study, I'm going to take the rate of the kick and snare to be the quote-unquote "tempo" of the song, which other authors might more specifically call the tempo of the drum pattern layer, since you could arguably say there are multiple tempos going on in a half-time or double-time feel. So when I say tempo going forward, I mean the rate of the kick and snare. I'm showing here both the median and mean tempo, mostly just to show you that the median and mean are about the same. The main thing to notice here is that songs in the 1960s seem to generally have faster tempos—and again, by "tempo" I mean the rate of the kick and snare—as compared to songs from later eras, like the late 1990s.

[NEXT] Here's one way to visualize this trend. In this chart, each pentade has its own boxplot showing the interquartile ranges of tempo. The black line in the middle of each box is the median tempo. The median moves around a bit, but it seems the generally go downward over time.

[NEXT] Indeed, if we do a linear regression on tempo versus year, we get a statistically significant negative slope, as indicated by the low P value. I won't get into too much depth today with how to interpret statistical tests, but generally speaking, a low P value—here it's less than point zero-zero-one—means that the

result is likely not due to chance. What I think we should care about more here, though, is the fairly low R squared value, which is only point zero-six-five. This R squared value means that the X-variable—the year—only explains about six and half percent of the variation in the Y-variable—tempo. That's a relatively small effect size. In other words, even though there is a low P value and this trend seems to be real, the size of this trend is small. So I wouldn't say with this data that the year of the song has much of a predictive effect on the rate of the drum tempo.

But of course, all songs and thus all meters are lumped together here, and that's potentially problematic. I wouldn't necessarily expect the kick and snare rate for a song in 6/8 to be the same as the kick and snare rate for a song in 4/4. So let's tease apart this data.

[NEXT] Here, for example, is a table of average drum tempos for songs where the kick and snare beat is NOT divided into two equal parts. In other words, it's either a compound meter or a meter with swung eighth notes. Again, it might be difficult to say whether the song is a compound meter or a meter with swing, since that distinction is based on tempo. The interesting thing here is not actually the average drum tempo but rather the number of songs that fall into this category per pentade. In the early 1960s, almost half the songs—23 out of 50—have a kick and snare beat that is NOT divided into two equal parts. By the mid-1970s, though, that number starts to noticeably drop off.

[NEXT] Here's a line plot of that same data, which implies that my initial hypothesis on the decline of eighth-note swing may be true. We see lots of compound meter and swing eighths in the early 1960s, but then much less in later decades. That said, it's still problematic that I have lumped together both swing eighths and compound meter here, but I can tease apart this data even further.

[NEXT] Here, for example, is a linear regression of this same subset of songs—in other words, these are only the songs where the kick and snare beat is NOT divided into two equal parts—showing the year as a predictor of tempo. Notice that the regression line is flat, the p value is large, and the R squared value is very low. In other words, with this subset of songs, the year offers no predictive value as to tempo. That may be because compound meter and swung eighths are lumped together here.

In fact, we can see some clustering of the data in this graph, showing evidence of how the use of compound meter and eighth-note swing changes over time. Remember, as discussed earlier, that commercial musicians typically associate slower kick-snare rates, like say 60 BPM, with compound meters like 6/8—which would include those data points below that black regression line—whereas commercial musician typically associate faster kick-snare rates, like say 120 BPM, with swung eighths—which would be those data points above the black regression line.

[NEXT] So in the 1960s, circled here in orange, we seem to have a lot of songs in 6/8 AND a lot of songs with swing eighths. [NEXT] But in the 1970s, circled here in purple, we mostly get slow tempos, implying mostly 6/8. By the 1970s, therefore, eight note swing seems to disappear. [NEXT] Then in the 1980s, circled here in blue, 6/8 disappears, with the faster tempos implying swing eights. [NEXT] And then in the 1990s, circled here in green, we see a return of 6/8 and another dormancy for swing eighths. I admit that there are not a lot of data points after the 1960s, so it would be nice to have a different or bigger corpus to confirm these decade-by-decade trends. Nonetheless, it appears that while the use of swing on the eighth notes doesn't entirely disappear after the 1960s, there may be certain eras—like the 1970s and 1990s—where swing eighths were much less commonly used. Now what about swing sixteenths?

[NEXT] Well, here is a line plot of the percent of songs where the kick and snare beat IS divided into two equal parts, but the next level down—which would be the sixteenth note if you take the kick and snare to be a quarter note—is NOT divided into two equal parts. In other words, this would include songs with swing sixteenths. From this graph, it appears that swing sixteenths started to become popular in the late 1980s and became especially common in the 1990s, with almost half of the songs in the early 1990s having swing two levels below the kick and snare rate.

[NEXT] It's actually interesting to compare this line plot—now shown in red—with the line plot we saw earlier with the percent of songs that did NOT divide the kick and snare beat into two equal parts—now shown in blue. So compound meter and swing eighths were common in the 1960s and then decline, which is mirrored by a rise in swing sixteenths during in the 1990s. In between, there is a valley during the

late 1970s and 1980s, where compound meter and swing at any level generally disappear. You might associate these trends with the influence of certain styles, like disco or funk, for example, which had their heyday in the 1970s and 1980s.

[NEXT] Now that we've taken a look at the history of compound meters, swing 8ths, and swing 16ths, let's revisit our linear regression of tempo versus year. Here is the same model as earlier, but now I have filtered out all the songs that could be considered to be in a compound meter or as having swing at any level. In other words, this regression plot includes only those songs in straight four-four, where the kick and snare is divided into two equal parts, and each of those divisions is then also divided into two equal parts. The result is still statistically significant, as indicated by the low P value. But more importantly, the R squared value—which is almost point one eight here—now indicates that we have somewhere between a moderate and a large effect size, conventionally speaking. In other words, if we just look at the straight four-four songs, there seems to be a real and noticeable trend of songs getting slower over time. [NEXT] I should admit that I'm not the first researcher to see a trend like this; Schellenberg and von Scheve, for example, found that popular music more broadly has gotten slower since the 1960s.

I think we can do better than trying to model tempo changes over time with a straight line, though. [NEXT] For example, here is a local polynomial regression on these same songs—those song in a straight four-four. You can see that this model predicts a kick and snare rate of about 120 BPM for the early 1960s, which then flattens out from the 1970s through the 1980s at around 100 BPM. Again, we can perhaps associate this general tempo shift with the tempo norms of different styles, like funk and disco. And then in the 1990s, it drops down to about 80 BPM.

[NEXT] OK, I'll conclude my talk today with a brief discussion. [NEXT] Let's return to these two diagrams we saw earlier and think about the implications for the history of meter in R&B music. Overall, my study seems to confirm my original hypothesis, that compound meter and eighth-note swing were common in the 1960s but then became less common as swing on the sixteenths increased in popularity during the 1990s. How might we explain this shift? Well, perhaps the decrease in kick-snare rates over time is part of the answer. If there is some general preference for the speed of swing to stay within some window of absolute time, then it makes

sense that when kick and snare rates slow down, there would be a corresponding shift in the level of swing within the metric hierarchy. In other words, swing sixteenths were perhaps rare in the 1960s simply because at the tempos that were common during that time, sixteenth notes are too fast to be swung, whereas in the 1990s, when the average kick-snare rate dropped to about 80 BPM, eighth note swing was just too slow to be viable.

Of course, it's possible that the casual arrow points in the other direction. Perhaps the desire for sixteenth note swing is what caused the decrease in average tempo. But I find that causal direction less convincing, since the trend of decreasing tempo is strongest for songs without any swing. So as the kick-snare rate dropped for straight four-four songs, this shift impacted at what corresponding metric level R&B musicians felt comfortable using swing. Whether or not we would see a corresponding shift in the use of swing in other styles, like country or rock, remains to be seen. But since it appears that tempo in popular music overall has gotten slower over time, as I mentioned earlier, I would imagine this trend away from swing eighths and towards swing sixteenths would also be found in popular music more broadly.

[NEXT] Well, that's about all the time I have today. There's certainly more to think about and talk about, so I'd be happy to take questions or discuss with you more, either now or afterwards. Thank you for listening!