

## **Measuring a Measure: Absolute Time as a Factor in Meter Classification for Pop/Rock Music**

### **Introduction**

Hello. If you would like to download the slides for my talk, you can do so at my web site, shown here at the bottom of this slide: [www.midside.com/slides/](http://www.midside.com/slides/).

When we analyze a song, how much music makes up a measure? [NEXT] For example, experts have analyzed the Beatles song “Norwegian Wood” as in 3/4, 6/8, and 12/8, with each time signature creating different bar lengths. Let’s listen, and I’ll conduct these various options. [NEXT] Like most recorded popular music, “Norwegian Wood” has no official score, so how do we determine which meter is best?

One prevailing approach has been to base bar lengths on the standard rock drum beat. [NEXT] This beat consists of a bar of 4/4 in which the kick occurs on beats 1 and 3 and the snare on beats 2 and 4. Inherently, though, this approach does not offer much guidance in dealing with songs that may not be in 4/4 or do not have a clear drum beat, such as “Norwegian Wood.” [NEXT] And while recent research on rhythmic organization in pop music has explored complex and mixed meters, little has been written about the more basic task of meter classification.

Now some of you may feel that measure lengths in popular music do not matter, but I would disagree. As William Caplin argues in his book on form in Classical music, I believe that bar lengths are an important benchmark for musical form. After all, many standard forms in popular music involve prototypical bar lengths, such as the 12-bar blues or the 32-bar AABA.

In this paper, I argue that the drum pattern is not a reliable, or at least consistently useful, indicator of measure lengths. Rather, we should take absolute time into consideration as well. In particular, the two-second measure appears to act as an ideal for experiential or “real” measures, and so we may often be best served by partitioning a song into measure lengths that most closely approximate two seconds. To be clear, I am not advocating for an automatic approach to measure lengths based on absolute time. I posit here today only that absolute time is another factor worth considering.

### **Background Evidence**

[NEXT] A number of works on rhythm and meter have been written in recent years, but these authors deal primarily with classical music, so the measure itself is almost always taken for granted. Temperley’s 2001 book offers the most systematic approach to meter, but his preference-rule system does not offer much advice when dealing with equally valid meters, such as in “Norwegian Wood.” In “Norwegian Wood,” the difference between 3/4, 6/8, and 12/8 is also a question of where we feel the beat and how many beats are in a bar. So let’s talk about beat perception, as it seems relevant.

Most research on beat perception focuses on absolute time. Certain tempos, quantified in beats-per-minute, or “BPM”, are said to be more ideal than others. [NEXT] Lerdahl and Jackendoff, for example, refer to the primary beat level, or the *tactus* – which is the rate at which you tap your foot – to be most comfortable around 70 BPM.

[NEXT] Work in the field of cognitive science has implied that a somewhat higher tempo may be preferred. As reported in Justin London’s book, some studies show that the ideal beat level lies closer to 100 BPM. [NEXT] More recent research has found that listeners give the most unambiguous tempo ratings for popular music around 120 BPM. So there seems to be some disagreement as to ideal tempo.

That said, some other evidence supports 120 BPM as the ideal for popular music, given a meter of 4/4. [NEXT] For example, 120 BPM is the starting tempo for new sessions in almost every digital audio workstation. [NEXT] I also recently conducted a corpus study to investigate average tempo, using all the songs from John Covach’s textbook, the 600+ songs in the 2011 McGill *Billboard* corpus, and the 200 songs in my *Rolling Stone* magazine corpus with Davy Temperley. [NEXT] As you can see, songs in all three corpora that were categorized in 4/4 had an average tempo somewhere around 120 BPM. At this rate, the average bar length is about two seconds.

Interestingly, songs in these same corpora that were not categorized as 4/4 do not have the same average tempo. [NEXT] For example, the average tempo for songs in 6/8 is only about 60 BPM – half that of 4/4. Yet the average measure length – about two seconds – is the same. [NEXT] So ideal tempo seems to depend on meter, and absolute time appears to more consistently determine measure lengths than it does average tempo. I hypothesize from this finding that listeners perceptually chunk music into windows of absolute time, and that our approach to bar lengths should take that into consideration.

### **Drum Feels**

[NEXT] In order to base measure lengths on absolute time rather than the drum pattern, we must accept that the number of kick and snare instances in a measure may differ from the standard 4/4 beat. In the drum literature, this concept is referred to as different drum “feels,” such as “double-time” or “half-time.” [NEXT] In a double-time feel, each bar has twice as many kick and snare hits as a standard feel; [NEXT] whereas in a half-time feel, each bar has half as many kick and snare hits. Note that double-time and half-time feels do not change the bar length or the primary beat level, such that the kick and snare alternate at a metric level above or below the *tactus*.

Let me offer some examples of these different feels to clarify this concept. [NEXT] Consider the song “Should I Stay or Should I Go” by The Clash. The verse is based on a standard 12-bar blues model and has a standard drum beat. Let’s listen [NEXT]. [NEXT] The chorus keeps the same 12-bar blues harmonic structure and has basically the same melody as the verse, so it makes sense to retain the same bar lengths.

But the kick and snare occur twice as often, creating a double-time feel. As we listen to this chorus, you may feel yourself somewhat conflicted about where to tap your foot, which is a hallmark of half-time and double-time feels. Let's listen [NEXT].

This last example shows the traditional approach to half-time and double-time, wherein the terms refer to relationships between drum patterns within the same song. But these drum feels can also describe relationships between songs.

[NEXT] For example, consider the song "Teardrops on My Guitar" by Taylor Swift. This song was released in multiple versions, all of which have the same harmony and melody, only different arrangements. The "pop" version, shown here, conveys a standard 4/4 drum feel at a rate of 100 BPM, which engenders bar lengths of about 2.4 seconds. Let's listen [NEXT].

The drum pattern throughout the "album" version of the song is noticeably slower. [NEXT] As shown here, I have notated the album version as a half-time feel in order to keep the melodic and harmonic content per bar the same as the pop version. Of course, it would have been possible to notate the album version as a normal feel, with the pop version as a double-time feel. But had I done so, the chorus would be only four bars long, which seems too short for a full-fledged chorus. The album version, therefore, makes more sense as a half-time feel in an absolute way, even if we had never heard the pop version as a reference. Let's listen [NEXT]. Note that I'm not picky about whether you hear this as 2/2 or 4/4, only that the measure lengths are as I show them here.

### **Meter Classification in Analysis**

These last two examples were obviously related, so we did not necessarily need the concept of absolute time to determine measure lengths. It's when songs are less obviously related that absolute time is helpful to show harmonic and melodic connections that might otherwise be obscured. I'll begin with the song "When the Levee Breaks." The original version is a 1920s-era blues song by Kansas Joe McCoy and Memphis Minnie, although most people are probably more familiar with Led Zeppelin's version.

[NEXT] If we follow the traditional approach to measure lengths, we would say that the verse of the Led Zeppelin version spans six bars. That's the view Dave Headlam takes in his analysis of the song, as shown here. Because Headlam is aware that Led Zeppelin's version derives from a blues song, he notes in his analysis – very pointedly, I must say – that Led Zeppelin have [quote] abandoned the strophic twelve-bar blues of the original [unquote] and that their version [quote] is not in twelve-bar units [unquote]. Indeed, the Led Zeppelin version is a radical departure from a standard 12-bar blues, especially since there is no harmonic motion during the verse. Let's listen, and I won't conduct this one. [NEXT]

But if we take absolute time into consideration, we arrive – as I am sure you have already guessed – at a different metric analysis. In particular, the tempo implied by the kick and snare – which is around 72 BPM – seems more like a duple meter or half-time feel.

This reading has important ramifications for our analysis, in that it engenders a 12-bar length for the main vocal material. In fact, it's not too difficult to imagine a re-harmonization of Led Zeppelin's version that re-establishes the harmonic scheme of a standard 12-bar blues. [NEXT] To illustrate that, I've mashed-up the original 1920s recording of the song with the Led Zeppelin drum beat. [NEXT]

So our method for determining measure lengths affects how we view the relationship between a song and formal prototypes. To elaborate this point, let's compare two songs by Elvis Presley. [NEXT] The first, "Heartbreak Hotel," has a relatively clear meter. John Covach, for example, views the main material as an 8-bar passage in 12/8, as shown here, which generates bar lengths of about 2.5 seconds at a tempo of 92 BPM, which is of course the best analysis based on absolute time. The music here is obviously derived from the blues, and so Covach refers to its 8-bar form as an abbreviated 12-bar blues, and I would agree. Let's listen. [NEXT]

[NEXT] The other Elvis song, "That's All Right," is one that Covach also identifies as blues-derived. Perhaps because of the fast backbeat, Covach views the main material of "That's All Right" as spanning 18 bars, as shown here, with each bar lasting about 1.1 seconds. Covach doesn't specify how this song derives from the blues, but based on reading the main material as an 18-bar span, we might guess it is an expansion of a 12- or 16-bar blues.

But if we reassess bar lengths in "That's All Right" based on absolute time, we uncover a different relationship between the song and the blues. I understand the main material as a 9-bar span, with measure lengths around 2.2 seconds. [NEXT] Note that – despite significant differences in surface rhythms – "Heartbreak Hotel" and "That's All Right" lay out highly similar formal structures over the course of absolute time. In terms of harmony, both songs have four bars of tonic, followed by two bars of subdominant, a move to the dominant (which is expanded in "That's All Right") [NEXT], ending with a single bar of tonic. In terms of melodic structure, both songs exhibit a 1+1+2 phrase organization in the first four bars, followed by two short phrases over IV prior to the final cadential phrase. Let's listen [NEXT]. So if "Heartbreak Hotel" can be considered an abbreviated version of a standard 12-bar blues, I think we have good reason to consider "That's All Right" an abbreviated 12-bar blues form as well.

In addition to relating songs to known prototypes, absolute time can also help uncover new organizational schemes. I will use two songs by Buck Owens to show this last point. [NEXT] Both of these songs share a highly specific musical skeleton, which is shown in this voice-leading graph. This graph specifies not just the harmonic and melodic goals, but also how these goals play out over time, as indicated via the bar numbers at the top.

[NEXT] We can hear this musical schema clearly in the verse from "Down to the River." As shown here, the verse can be viewed in 12/8 with a tempo of about 148 BPM, which engenders measure lengths of about 1.6 seconds. As we listen, I'll sing the melodic goals of the schema. [NEXT]

[NEXT] The other Buck Owens song is “Cryin’ Time.” As shown here, I have transcribed the song in 6/8. Undeniably, it has a much slower feel than “Down to the River,” and it certainly would be possible to hear the song as a slow 12/8. But as a slow 12/8, we would have measure lengths of about 3.2 seconds, which is much farther from the two-second ideal than the bar lengths I have chosen here, which last about 1.6 seconds. As we listen to this song, you should hear the same harmonic and melodic framework moving through absolute time as in the previous song, only in the context of a different metric feel. Again, I’ll sing the melodic goals of the schema as we listen.

[NEXT]

## Conclusion

[NEXT] To conclude, my goal has been to argue three points: 1) that the drum pattern is not a reliable or consistently useful guide by which to determine measure lengths in popular music; 2) that absolute time should be considered as a factor when determining measure lengths; and 3) that a two-second measure length in particular may be the ideal perceptual reference point by which bar lengths in popular music can often be assessed.

Again, I am not advocating for some sort of automatic bar length or meter classification system. I freely admit that other aspects— such as harmonic rhythm or form prototypes — are central to our conception of measure lengths. Nonetheless, pop/rock music — perhaps because it is primarily a vocal medium, and speech declamation rates are somewhat limited given the confines of intelligibility — often exhibits a consistent and moderate pacing of harmonic and melodic content — i.e., “form” — that is relatively stable in terms of absolute time, despite the rhythmic framework as implied by the drum pattern.

[NEXT] To wrap up, I’ll end where I started, with the question of the best meter for “Norwegian Wood.” Of the possible readings — 3/4, 6/8, and 12/8 — which one is best?

[NEXT] It turns out that 6/8 generates bar lengths that are almost exactly two seconds long. Reading the song as in 6/8 turns out to be an important part of Covach’s thesis in his 2006 paper on the Beatles, since this meter allows him to relate the song’s form to a prototypical 32-bar AABA structure, and in so doing, he shows convincingly that this song stands as an important transitional step in the artistic development of the Beatles.

So as we choose the best meter or measure lengths for other songs, I hope that the consideration of absolute time will help facilitate similarly insightful analyses, such that we can identify harmonic, melodic, and formal relationships between songs that may have different surface-level rhythmic features.[NEXT]